



ภาคผนวก 65  
เอกสารการสอบเทียบเครื่องมือและอุปกรณ์  
ตรวจวัดคุณภาพสิ่งแวดล้อม

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## List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Ambient</b>									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP)	Andersen Instruments, Inc.	G25A 11MX	Tisch Environmental, Inc.	28062022	28 Jun 21	27 Jun 23	-
2	U-Tube Manometer	Total Suspended Particulate (TSP)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	22P803	12 Mar 22	11 Mar 23	-
3	Mass Flow Meter	Propylene Ethylene Hexane	Alicat Scientific, Inc.	MB-5SCCM-D/5M 57730	Miracle International Technology Co., Ltd.	L202210260-001	5 Nov 22	4 Nov 23	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Propylene Ethylene Hexane	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22P2722	22 Jul 22	21 Jul 23	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Propylene Ethylene Hexane	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H1586	27 Jul 22	26 Jul 23	-
6	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6307	Innovative Instrument Co., Ltd.	22-ACT-373	8 Jun 22	7 Jun 23	-
7	Sound Level Meter	L <sub>Aeq</sub> 24 hrs* L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument Co., Ltd.	22-ACT-248	1 Apr 22	31 Mar 23	-
				0005344					
8	Sound Level Meter	L <sub>Aeq</sub> 24 hours* L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument Co., Ltd.	22-ACT-105	11 Feb 22	10 Feb 23	-
				0005396					
9	Sound Level Meter	L <sub>Aeq</sub> 24 hours* L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument Co., Ltd.	22-ACT-035	21 Jan 22	20 Jan 23	-
				0005398					

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	pH100A JC03354	Technology Promotion Association (Thailand-Japan)	22CH60	13 Jan 22	12 Jan 23	-

## List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Workplace</b>									
1	Primary Flow Calibrator	Calibrate personal pump	TSL Inc	4146 41461708009	Innovative Instrument Co.,Ltd.	22-AFM-040	22 Mar 22	21 Mar 23	-
2	Aneroid Barometer	Total Hydrocarbons Propylene Ethylene Total dust	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22P2723	22 Jul 22	21 Jul 23	-
3	Digital Thermo - Hygrometer	Total Hydrocarbons Propylene Ethylene Total dust	Testo, Germany	608-H1 34843033	Technology Promotion Association (Thailand-Japan)	22H1990	27 Sep 22	26 Sep 23	-
4	Noise Dosimeter	Noise Dosimeter	SvanteK	SV 104 91925	Innovative Instrument Co.,Ltd.	22-ACT-033	21 Jan 22	20 Jan 23	-
5	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	SvanteK	SV36 107224	Innovative Instrument Co.,Ltd.	21-ACT-326	24 Aug 21	23 Aug 22	-
6	Sound Level Meter	Octave Band	Rion,japan	NL-62 00391458	Sithiporn Associates Co.,LTD	ACL22077	21 Jan 22	24 Jan 23	-
7	Sound Level Meter	Octave Band	Rion,japan	NL-62 00391494	Sithiporn Associates Co.,LTD	ACL22078	21 Jan 22	24 Jan 23	-
8	Sound Level Meter	$L_{Aeq\ 12\ hours}$ $L_{Amax}$	Larson Davis	LxT2 0005402	Innovative Instrument Co.,Ltd.	22-ACT-103	11 Feb 22	10 Feb 23	-
9	Sound Level Meter	$L_{Aeq\ 12\ hours}$ $L_{Amax}$	Larson Davis	LxT2 0006617	Innovative Instrument Co.,Ltd.	22-ACT-100	11 Feb 22	10 Feb 23	-
10	Sound Level Meter	$L_{Aeq\ 12\ hours}$ $L_{Amax}$	Larson Davis	LxT2 0005396	Innovative Instrument Co.,Ltd.	22-ACT-105	11 Feb 22	10 Feb 23	-

RECALIBRATION  
DUE DATE:  
June 28, 2022

# Certificate of Calibration

Calibration Certification Information				
Cal. Date: June 28, 2022	Rootmeter S/N: 438320	Ta: 297	"K	
Operator: Jim Tisch		Pa: 753.6	mm Hg	
Calibration Model #: G25A	Calibrator S/N: 11MX			

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3910	3.3	2.00
2	3	4	1	0.9890	6.4	4.00
3	5	6	1	0.8850	8.0	5.00
4	7	8	1	0.8430	9.0	5.50
5	9	10	1	0.6970	12.9	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \times \frac{Vstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9906	0.7124	1.4106	0.9956	0.7158	0.8878
0.9965	0.9975	1.9849	0.9915	1.0025	1.3555
0.9844	1.1173	2.2304	0.9894	1.1179	1.4037
0.9831	1.1661	2.3393	0.9881	1.1721	1.4723
0.9779	1.4030	2.8213	0.9829	1.4102	1.7756
QSTD		m= 2.04215	QA		m= 1.27876
		b= -0.04258			b= -0.02680
		r= 1.00000			r= 1.00000

Calculations	
Vstd = $\Delta Vol / (Pa - Pstd) / (Tstd / Ta)$	Va = $\Delta Vol / (Pa - Pstd) / (Ta / Pa)$
Qstd = Vstd / ΔTime	Qa = Va / ΔTime
For subsequent flow rate calculations:	
Qstd = $1/m \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \times \frac{Vstd}{Ta} \right)} \right) h$	Qa = $1/m \left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} \right) h$

Standard Conditions	
Tstd	298.15 °K
Pstd	760 mm Hg
Key	
ΔH	calibrator manometer reading (in H2O)
ΔP	rootmeter manometer reading (mm Hg)
Ta	air actual absolute temperature (°K)
Pa	air actual barometric pressure (mm Hg)
b	intercept
m	slope

RECALIBRATION	
US EPA recommends annual recalibration per 139B	
40 Code of Federal Regulations Part 50 to 51,	
Appendix B to Part 50, Reference Method for the	
Determination of Suspended Particulate Matter in	
the Atmosphere, 9.2.17, page 30	

Tisch Environmental, Inc.  
145 South Miami Avenue  
Village of Cleves, OH 45002

www.tisch-env.com  
TOLL FREE: (877)263-7610  
FAX: (513)867-9009

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
1344 PATANAKARN ROAD SOI 18, SIAMLIANG, SIAMLIANG, BANGKOK 10230  
TEL.: 0-2715-3800-24 FAX: 0-2718-9484

## Certificate of Calibration

Certificate No.: 22P803  
Page: 1 of 2

Equipment: U Tube Manometer  
Manufacturer: Dwyer  
Model: 1221-36-W/M  
Serial No.: -  
ID No.: UAE.EFM.178/2561

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

Condition As-Received: Used Item  
Received Date: 03 March 2022  
Calibration Date: 12 March 2022

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Reference: 2203-013FWSC  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1010 mbar

81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "OKD-R 6-1: Calibration of Pressure Gauges, Edition 03/2014" as a guidelines.


### Condition of this result of calibration

1. Reference standards instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0110-21	09 Aug 2022

- This result of calibration was made on requested at the point specified by customer.
- Scale and conversion factor is 1 kPa = 4.0146293 inHgO
- This instrument was used clean air as pressure media
- This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.
- This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certification is traceable to the International System of Unit maintained at:-  
National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Aussamee  
Issue Date: 14 March 2022

Approved Signatory:   
Pholinee Prabpai  
Sura Suwanasri  
Attapol Panurach

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Cert. No.: 22P803  
Page: 2 of 2

Result of calibration:- Without adjustment  
Function:- Pressure Measurement  
Increasing Pressure

Range: 0 inH2O to 36 inH2O  
Scale Interval: 0.1 inH2O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH2O)	High-port side (inH2O)	Low-port side (inH2O)	ΔP (inH2O)	Error (inH2O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-0.98	1.98	-0.04
4.00	2.00	-1.96	3.96	-0.04
6.00	3.00	-2.94	5.94	-0.04
8.00	4.00	-3.94	7.94	-0.06
10.00	5.00	-4.94	9.94	-0.06
12.00	6.00	-5.94	11.94	-0.06
14.00	7.02	-6.94	13.96	-0.04
16.00	8.02	-7.94	15.96	-0.04
18.00	9.04	-8.96	18.00	0.00
20.00	10.04	-9.96	20.00	0.00
22.00	11.06	-10.98	22.02	0.02
24.00	12.06	-11.96	24.02	0.02
26.00	13.08	-12.98	26.06	0.06
28.00	14.08	-13.98	28.06	0.06
30.00	15.10	-14.98	30.08	0.08
32.00	16.10	-15.98	32.08	0.08
34.00	17.08	-16.98	34.06	0.06
36.00	17.86	-18.00	35.86	0.36

The uncertainty of measurement was ± 0.11 inH2O  
\* UUC = Unit Under Calibration

\* ΔP = High-port side - Low-port side

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

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MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD  
214 Bangwaek Rd. Bangnai Bangkok Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



## CALIBRATION CERTIFICATE

Certificate No.: L202210260-001  
Date Issued: 07-Nov-22

Customer: United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Equipment: Mass Flow Meter  
Manufacturer: Alicat Scientific  
Model: MB-5SCCM-D/5M  
Serial No.: 57730  
ID No./Tag No.: UAE/EMA2.169/2553  
Date Received: 31-Oct-22  
Date Calibrated: 05-Nov-22  
Calibrated by: Mr. Jame Khonthong

### Calibration Method or Calibration Procedure Used

In-house method: CP-34 by comparison against mass flow calibrator.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

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Approved by:   
(Mr. Sarayuth Toehua)



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Certificate No. : L202210260-001

Environment : Ambient temperature : ( 23 ± 2 ) °C  
Relative humidity : ( 50 ± 15 ) % RH

Capacity Range : 5 ml/min

Calibration Media : Air

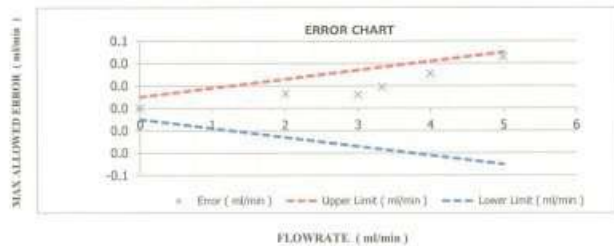
Type : Mass Flowmeter

Unit Under Calibration Reference Condition : Pressure 101.325 kPa(abs) - 23 °C - Air

Temperature ( °C )	Pressure ( kPa )	UUC Reading ( ml/min )	STD Reading ( ml/min )	Error ( ml/min )	Uncertainty ( ± ml/min )
25.73	101.45	0.000	0.000 *	0.000	0.063
25.37	104.90	2.001	1.988	0.013	0.068
25.12	106.63	3.001	2.989	0.012	0.11
24.66	107.15	3.330	3.311	0.019	0.12
24.23	108.36	4.001	3.970	0.031	0.14
24.17	110.09	5.00	4.954	0.046	0.17

Error = Unit Under Calibration - Standard

Marked \* are not included in the NSC-ONSC accreditation schedule for our laboratory.



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Certificate No. : L202210260-001

Note : The actual flow rate is determined by the equation :

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

: Q = Flow rate  
: P = Absolute pressure  
: T = Absolute temperature  
: Subscript "Meas" = Measurement condition  
: Subscript "Ref" = Reference condition

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Traceability of Certificate :

The International System of Units (SI) through

NIMT Certificate No. MW-0013-22 for Mass Flow Calibrator (20 SCCM) Serial No. G300971G20, Due:22-Feb-24

End of Certificate

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## Certificate of Calibration

Certificate No. : ZSP2722  
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No. : UAE-ANV-013/2547

Condition As-Received : Used Item

Received Date : 20 July 2022

Calibration Date : 22 July 2022

Reference : 2207-0084WSC

Ambient Temperature : ( 23 ± 2 ) °C

Relative Humidity : ( 50 ± 15 ) %

Atmospheric Pressure : 1010 mbar

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

Submitted by : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok,  
Phrahanong, Bangkok 10260

Procedure used : The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using " DKD-R 6-1 : Calibration of Pressure Gauges, Edition 03/2014 " as a guideline.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0076-22	02 May 2023

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. Scale and conversion factor is 1 kPa = 7.50062 mmHg

5. This result of calibration instrument was in absolute pressure.

6. This instrument was used clean air as pressure media.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Assamsee  
Issue Date : 25 July 2022

Approved Signatory : Attapol P.  
[ ] Phatinee Pradapipul  
[ ] Suta Suwananasi  
[x] Attapol Panurach

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD BOX 18, SUKHUMVIT ROAD, BANGKOK 10250  
TEL: 0-2713-3000-24 FAX: 0-2719-9488



Result of calibration : Without adjustment

Function : Absolute Pressure Measurement

Range : 720 mmHg to 780 mmHg

Scale Interval : 1 mmHg ( The Filler Estimate )

Increasing Pressure

Applied Pressure (mmHg)	718.48	728.33	738.85	750.22	760.90	772.01	785.89
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	1.54	0.67	0.15	-0.22	-0.90	-2.01	-5.89

Decreasing Pressure

Applied Pressure (mmHg)	785.90	771.99	760.85	750.17	738.90	728.57	718.62
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-5.90	-1.99	-0.85	-0.17	0.10	0.43	1.38

The uncertainty of measurement was ± 0.24 mmHg

\* UUC = Unit Under Calibration

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

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Cert.No. : ZSP2722  
Page : 2 of 2

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## Certificate of Calibration

Certificate No.: 22H1588  
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Baigo

Model: -

Serial No.: -

ID No.: UAE-ANV-094/2548

Condition As-Received: Used Item

Received Date: 20 July 2022

Calibration Date: 22 July 2022

Reference: 2207-056H9C

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Prakanong, Bangkok 10260

Procedure used: Calibration was conducted using in-house calibration procedure CP-H02 according to comparison  
with standard chilled mirror sensor for humidity measurement function and comparison with standard  
temperature probe for temperature measurement function into humidity / temperature chamber.

### Condition of this result of calibration

#### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	17 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0125-21	13 Dec 2022

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

3. This Certification is traceable to the International System of Unit maintained at:-

- National Institute of Standards and Technology (NIST), The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Somchai Dumwor  
Issue Date: 03 August 2022

Approved Signatory:

[✓] Chakrit Wawarua  
[ ] Pongthipha Tameyaskul  
[ ] Vipom Tanthiyawull

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Cert. No.: 22H1588  
Page: 2 of 2

### Result of Calibration:

Function:

Before Adjustment  
Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	38	-2.1	1.0
25.0	60.0	57	-3.0	1.8
25.0	80.0	74	-6.0	2.0

### Result of Calibration:

Function:

After Adjustment  
Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	-0.1	1.8
25.0	60.0	60	0.0	1.8
25.0	80.0	77	-3.0	2.0

### Result of Calibration:

Function:

Without Adjustment  
Temperature measurement.

Reference Temperature (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.00	20.5	0.50	0.72	0.72
25.04	25.0	-0.04	0.72	0.72
30.01	30.0	-0.01	0.72	0.72
35.04	34.5	-0.54	0.72	0.72
39.98	39.0	-0.98	0.72	0.72

UUC\*: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied  
by coverage factor k = 2.00, providing confidence level approximately 95%.

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## Certificate of Calibration

Customer

Name: UNITED ANALYST AND ENGINEERING CONSULTANT  
CO., LTD.

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Prakanong, Bangkok 10260

Certificate No.: 22-ACT-373

Request No.: Req-2022-0840

### Unit Under Calibration Details

Measurement item: Acoustic Calibrator

Manufacturer: LASON DAVIS

Model: CAL130

Serial Number: 6307

ID: UAE-EFM-048/2563

Class: 2

Range: 94, 114 dB / 1000 Hz

Instrument Status: Used

### Calibration Environment and Details

Temperature: ( 23 ± 2 °C )

Humidity: ( 50 ± 20 %RH )

Barometric Pressure: ( 1013 ± 0.0 hPa )

Received Date: 10 May 2022

Calibration Date: 8 June 2022

Location of Calibration: LAB 1 Acoustic

Calibration Procedure: In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2023
THD Multimeter	2015	1047765	NIMT	2 February 2023

Traceability: This certificate provides traceability of measurement to recognized national standard, and to the  
realization of the International System of Units (SI).

### Note

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

Calibrated By:

Mr. Noppadon Luangrat  
Service Calibration Engineer

Approved By:

Mr. Pacit Mathayom  
Calibration Engineer Supervisor

Issue Date: 8 June 2022

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Certificate No.: 22-ACT-373

Request No.: Req-2022-0840

### Sound pressure level

Calibration Results: Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance Limit Class 2 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.02	0.02	-	-	0.11	0.40
114 dB / 1000 Hz	114.10	0.10	-	-	0.11	0.40

### Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance Limit Class 2 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	999.00	0.10	-	-	0.10	1.7
114 dB / 1000 Hz	999.00	0.10	-	-	0.10	1.7

### Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance Limit Class 2 (± %)
	Measured (%)	Error (%)	Measured (%)	Error (%)		
94 dB / 1000 Hz	0.12	-	-	-	0.40	3.0
114 dB / 1000 Hz	0.23	-	-	-	0.40	3.0

### Note:

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results include the calibration pressure correction
- The calibration results include the microphone volume correction

End of Calibration

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# Certificate of Calibration

## Customer

Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 81 Suk Udomsuk Rd, Sukhumvit Road, Bangkok, Prakanong, Bangkok  
10100

Certificate No: 22-ACT-048  
Request No: Req-2022-0628

## Unit Under Calibration Details

Measurement item: Sound Level Meter  
Manufacturer: LARSON DAVIS  
Model: LxT2  
Serial Number: 9009346  
ID: LMEEFM001261  
Resolution: 0.1 dB  
Microphone Class: 2  
Microphone Model: J75A08  
Microphone S/N: J29042  
Preamplifier Model: PPM1A73C  
Preamplifier S/N: 071484  
Interment Status: Used

## Calibration Environment and Details


Temperature: 23 °C ± 2 °C  
Humidity: 50 %RH ± 20 %RH  
Barometric Pressure: 1013 kPa ± 10 kPa  
Received Date: 23 March 2022  
Calibrated Date: 1 April 2022  
Calibration Procedure: In-house method CP-SLM-01 based on IEC 61672-1:2013 Electromagnetic - Sound level meters - Part 1: Periodic tests  
Location of Calibration: Lab Account


## Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	180271	13 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-vid	EFA00234	14 June 2022	TSI
Audio Generator	Sennheiser	RS4001	131	10 October 2022	W.K. Ebersole

## Note

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

Calibrated By:   
Mr. Supakorn Lungsang  
Calibration Officer

Approved By:   
Mr. Paol Mathamon  
Calibration Engineer Supervisor  
Issue Date: 1 April 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the provider. เอกสารไม่ควบคุม

Certificate No: 22-ACT-048  
Request No: Req-2022-0628

## 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		Level	UUC	ERR	UUC	ERR	
FAST / A / 37-139							
Calibrator Setting		(dB)	(dB)	(dB)	(dB)	(dB)	
1000 Hz 114.00 dB	113.80	113.7	-6.15	113.9	-0.05	0.20	0.2

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN 280794

## 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	( $\pm$ dB)
A	28.1	0.10

## 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	( $\pm$ dB)
A	28.4	0.10
C	28.4	0.10
Z	27.8	0.10

## 4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z		
FAST / 37-139					
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.0	0.0	0.30	2.0
1000 Hz	0.0	0.0	0.0	0.00	1.0
4000 Hz	0.2	0.2	0.2	0.00	3.0
8000 Hz	0.0	0.0	0.1	0.70	5.0

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Certificate No: 22-ACT-048  
Request No: Req-2022-0628

## 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting	(dB)	(dB)	(dB)		
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5.0
10000 Hz	-0.1	-0.1	-0.1		>5, <00

## 5. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF	ERR		
FAST / 37-139					
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF	ERR		
37-139 / A					
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.1	0.1
Slow	114.00	114.0	0.0	0.1	0.1
Log	114.00	114.0	0.0		

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Certificate No: 22-ACT-048  
Request No: Req-2022-0628

## 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139			
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.2

## 8. Level linearity on the reference level range

UUC Setting		Anticipated REF (dB)	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 27-139			UUC (dB)	ERR (dB)		
STD dB						
110.00		120	120.0	0.0	0.3	1.1
114.00		124	124.0	0.0		1.1
118.00		128	128.0	0.0		1.1
122.00		132	132.0	0.0		1.1
126.00		136	136.0	0.0		1.1
130.00		140	140.0	0.0		1.1
134.00		144	144.0	0.0		1.1
138.00		148	148.0	0.0		1.1
142.00		152	152.0	0.0		1.1
146.00		156	156.0	0.0		1.1
150.00		160	160.0	0.0		1.1
154.00		164	164.0	0.0		1.1
158.00		168	168.0	0.0		1.1
162.00		172	172.0	0.0		1.1
166.00		176	176.0	0.0		1.1
170.00		180	180.0	0.0		1.1
174.00		184	184.0	0.0		1.1
178.00		188	188.0	0.0		1.1
182.00		192	192.0	0.0		1.1
186.00		196	196.0	0.0		1.1
190.00		200	200.0	0.0	1.1	
194.00		204	204.0	0.0	1.1	
198.00		208	208.0	0.0	1.1	
202.00		212	212.0	0.0	1.1	
206.00		216	216.0	0.0	1.1	
210.00		220	220.0	0.0	1.1	
214.00		224	224.0	0.0	1.1	
218.00		228	228.0	0.0	1.1	
222.00		232	232.0	0.0	1.1	
226.00		236	236.0	0.0	1.1	
230.00		240	240.0	0.0	1.1	
234.00		244	244.0	0.0	1.1	
238.00		248	248.0	0.0	1.1	
242.00		252	252.0	0.0	1.1	
246.00		256	256.0	0.0	1.1	
250.00		260	260.0	0.0	1.1	
254.00		264	264.0	0.0	1.1	
258.00		268	268.0	0.0	1.1	
262.00		272	272.0	0.0	1.1	
266.00		276	276.0	0.0	1.1	
270.00		280	280.0	0.0	1.1	
274.00		284	284.0	0.0	1.1	
278.00		288	288.0	0.0	1.1	
282.00		292	292.0	0.0	1.1	
286.00		296	296.0	0.0	1.1	
290.00		300	300.0	0.0	1.1	
294.00		304	304.0	0.0	1.1	
298.00		308	308.0	0.0	1.1	
302.00		312	312.0	0.0	1.1	
306.00		316	316.0	0.0	1.1	
310.00		320	320.0	0.0	1.1	
314.00		324	324.0	0.0	1.1	
318.00		328	328.0	0.0	1.1	
322.00		332	332.0	0.0	1.1	
326.00		336	336.0	0.0	1.1	
330.00		340	340.0	0.0	1.1	
334.00		344	344.0	0.0	1.1	
338.00		348	348.0	0.0	1.1	
342.00		352	352.0	0.0	1.1	
346.00		356	356.0	0.0	1.1	
350.00		360	360.0	0.0	1.1	
354.00		364	364.0	0.0	1.1	
358.00		368	368.0	0.0	1.1	
362.00		372	372.0	0.0	1.1	
366.00		376	376.0	0.0	1.1	
370.00		380	380.0	0.0	1.1	
374.00		384	384.0	0.0	1.1	
378.00		388	388.0	0.0	1.1	
382.00		392	392.0	0.0	1.1	
386.00		396	396.0	0.0	1.1	
390.00		400	400.0	0.0	1.1	
394.00		404	404.0	0.0	1.1	
398.00		408	408.0	0.0	1.1	
402.00		412	412.0	0.0	1.1	
406.00		416	416.0	0.0	1.1	
410.00		420	420.0	0.0	1.1	
414.00		424	424.0	0.0	1.1	
418.00		428	428.0	0.0	1.1	
422.00		432	432.0	0.0	1.1	
426.00		436	436.0	0.0	1.1	
430.00		440	440.0	0.0	1.1	
434.00		444	444.0	0.0	1.1	
438.00		448	448.0	0.0	1.1	
442.00		452	452.0	0.0	1.1	
446.00		456	456.0	0.0	1.1	
450.00		460	460.0	0.0	1.1	
454.00		464	464.0	0.0	1.1	
458.00		468	468.0	0.0	1.1	
462.00		472	472.0	0.0	1.1	
466.00		476	476.0	0.0	1.1	
470.00		480	480.0	0.0	1.1	
474.00		484	484.0	0.0	1.1	
478.00		488	488.0	0.0	1.1	
482.00		492	492.0	0.0	1.1	
486.00		496	496.0	0.0	1.1	
490.00		500	500.0	0.0	1.1	
494.00		504	504.0	0.0	1.1	
498.00		508	508.0	0.0	1.1	
502.00		512	512.0	0.0	1.1	
506.00		516	516.0	0.0	1.1	
510.00		520	520.0	0.0	1.1	
514.00		524	524.0	0.0	1.1	
518.00		528	528.0	0.0	1.1	
522.00		532	532.0	0.0	1.1	
526.00		536	536.0	0.0	1.1	
530.00		540	540.0	0.0	1.1	
534.00		544	544.0	0.0	1.1	
538.00		548	548.0	0.0	1.1	
542.00		552	552.0	0.0	1.1	
546.00		556	556.0	0.0	1.1	
550.00		560	560.0	0.0	1.1	
554.00		564	564.0	0.0	1.1	
558.00		568	568.0	0.0	1.1	
562.00		572	572.0	0.0	1.1	
566.00		576	576.0	0.0	1.1	
570.00		580	580.0	0.0	1.1	
574.00		584	584.0	0.0	1.1	
578.00		588	588.0	0.0	1.1	
582.00		592	592.0	0.0	1.1	
586.00		596	596.0	0.0	1.1	
590.00		600	600.0	0.0	1.1	
594.00		604	604.0	0.0	1.1	
598.00		608	608.0	0.0	1.1	
602.00		612	612.0	0.0	1.1	
606.00		616	616.0	0.0	1.1	
610.00		620	620.0	0.0	1.1	
614.00		624	624.0	0.0	1.1	
618.00		628	628.0	0.0	1.1	
622.00		632	632.0	0.0	1.1	
626.00		636	636.0	0.0	1.1	
630.00		640	640.0	0.0	1.1	
634.00		644	644.0	0.0	1.1	
638.00		648	648.0	0.0	1.1	
642.00		652	652.0	0.0	1.1	
646.00		656	656.0	0.0	1.1	
650.00		660	660.0	0.0	1.1	
654.00		664	664.0	0.0	1.1	
658.00		668	668.0	0.0	1.1	
662.00		672	672.0	0.0	1.1	
666.00		676	676.0	0.0	1.1	
670.00		680	680.0	0.0	1.1	
674.00		684	684.0	0.0	1.1	
678.00		688	688.0	0.0	1.1	
682.00		692	692.0	0.0	1.1	
686.00		696	696.0	0.0	1.1	
690.00		700	700.0	0.0	1.1	
694.00		704	704.0	0.0	1.1	
698.00		708	708.0	0.0	1.1	
702.00		712	712.0	0.0	1.1	
706.00		716	716.0	0.0	1.1	
710.00		720	720.0	0.0	1.1	
714.00		724	724.0	0.0	1.1	
718.00		728	728.0	0.0	1.1	
722.00		732	732.0	0.0	1.1	
726.00		736	736.0	0.0	1.1	
730.00		740	740.0	0.0	1.1	
734.00		744	744.0	0.0	1.1	
738.00		748	748.0	0.0	1.1	
742.00		752	752.0	0.0	1.1	
746.00		756	756.0	0.0	1.1	
750.00		760	760.0	0.0	1.1	
754.00		764	764.0	0.0	1.1	
758.00		768	768.0	0.0	1.1	
762.00		772	772.0	0.0	1.1	
766.00		776	776.0	0.0	1.1	
770.00		780	780.0	0.0	1.1	
774.00		784	784.0	0.0	1.1	
778.00		788	788.0	0.0	1.1	
782.00		792	792.0	0.0	1.1	
786.00		796	796.0	0.0	1.1	
790.00		800	800.0	0.0	1.1	
794.00		804	804.0	0.0	1.1	
798.00		808	808.0	0.0	1.1	
802.00		812	812.0	0.0	1.1	
806.00		816	816.0	0.0	1.1	
810.00		820	820.0	0.0	1.1	
814.00		824	824.0	0.0	1.1	
818.00		828	828.0	0.0	1.1	
822.00		832	832.0	0.0	1.1	
826.00		836	836.0	0.0	1.1	
830.00		840	840.0	0.0	1.1	
834.00		844	844.0	0.0	1.1	
838.00		848	848.0	0.0	1.1	
842.00		852	852.0	0.0	1.1	
846.00		856	856.0	0.0	1.1	
850.00		860	860.0	0.0	1.1	
854.00		864	864.0	0.0	1.1	
858.00		868	868.0	0.0	1.1	
862.00		872	872.0	0.0	1.1	
866.00		876	876.0	0.0	1.1	
870.00		880	880.0	0.0	1.1	
874.00		884	884.0	0.0	1.1	
878.00		888	888.0	0.0	1.1	
882.00		892	892.0	0.0	1.1	
886.00		896	896.0	0.0	1.1	
890.00		900	900.0	0.0	1.1	
894.00		904	904.0	0.0	1.1	
898.00		908	908.0	0.0	1.1	
902.00		912	912.0	0.0	1.1	
906.00		916	916.0	0.0	1.1	
910.00		920	920.0	0.0	1.1	
914.00		924	924.0	0.0	1.1	
918.00		928	928.0	0.0	1.1	
922.00		932	932.0	0.0	1.1	
926.00		936	936.0	0.0	1.1	
930.00		940	940.0	0.0	1.1	
934.00		944	944.0	0.0	1.1	
938.00		948	948.0	0.0	1.1	
942.00		952	952.0	0.0	1.1	
946.00		956	956.0	0.0	1.1	
950.00		960	960.0	0.0	1.1	
954.00		964	964.0	0.0	1.1	
958.00		968	968.0	0.0	1.1	
962.00		972	972.0	0.0	1.1	
966.00		976	976.0	0.0	1.1	
970.00		980	980.0	0.0	1.1	
974.00		984	984.0	0.0	1.1	
978.00		988	988.0	0.0	1.1	
982.00		992	992.0	0.0	1.1	
986.00		996	996.0	0.0	1.1	
990.00		1000	1000.0	0.0	1.1	
994.00		1004	1004.0	0.0	1.1	
998.00		1008	1008.0	0.0	1.1	
1002.00		1012	1012.0	0.0	1.1	
1006.00		1016	1016.0	0.0	1.1	
1010.00		1020	1020.0	0.0	1.1	
1014.00		1024	1024.0	0.0	1.1	
1018.00		1028	1028.0	0.0	1.1	
1022.00		1032	1032.0	0.0	1.1	
1026.00		1036	1036.0	0.0	1.1	
1030.00		1040	1040.0	0.0	1.1	
1034.00		1044	1044.0	0.0	1.1	
1038.00		1048	1048.0	0.0	1.1	
1042.00		1052	1052.0	0.0	1.1	



Certificate No : 22-ACT-249  
Request No : Req-2022-0628

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC	ERR		
FAST / A	REF	(dB)	(dB)		
UUC Range	(dB)	(dB)	(dB)		
37-139	84.2	84.4	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
			UUC	ERR		
A / 37-139	Toneburst	(dB)	(dB)	(dB)		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	133.0	133.0	0.0	0.3	3.0
	2	118.0	117.7	-0.3		+1.0, -2.5
	0.25	109.0	108.8	-0.2		+1.5, -5.0
Slow	200	128.0	128.5	+0.5	0.3	3.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	100.0	100.0	0.0		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC	ERR		
FAST / C / 93-142	REF	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.7	-0.70	0.2	3.0
Positive half cycle	136.4	136.1	-0.30		3.0
Negative half cycle	136.4	136.2	-0.20		3.0

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

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Certificate No : 22-ACT-249  
Request No : Req-2022-0628

12. Overload indication

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	143.2		
Negative one-half cycle	143.1		
Detected	0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	138.9		
Final	138.9		
Detected	0.0	0.1	0.3

End of Certificate

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

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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260  
Certificate No : 22-ACT-105  
Request No : Req-2022-0229

Unit Under Calibration Details:

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LxT2  
Serial Number : 0002196  
ID : UAE.EFM0332664  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 329359  
Preamplifier Model : PRMLxT2C  
Preamplifier S/N : 073812  
Instrument Status : Used

Calibration Environment and Details


Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
Humidity :  $50\% \text{RH} \pm 20\% \text{RH}$   
Barometric Pressure :  $1013 \text{ hPa} \pm 10 \text{ hPa}$   
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	13 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svante	Svan01	131	18 October 2022	WK Electric

Note

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

Calibrated By :   
Mr. Noppadol Luangnit  
Calibration Officer

Approved By :   
Mr. Paitt Mahavorn  
Calibration Engineer Supervisor  
Issue Date : 11 February 2022

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

PM-598-SLM-01 Rev.0 Issue Date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC	ERR	UUC	ERR		
FAST / A / 37-139	(dB)	(dB)	(dB)	(dB)	(dB)		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.01	0.20	0.1

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 15A, S/N:58879.

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting	(dB)	( $\pm$ dB)
A	27.8	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting	(dB)	( $\pm$ dB)
A	27.8	0.10
C	27.3	0.10
Z	33.1	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.1	0.2	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.00	1.0
4000 Hz	0.6	0.5	0.6	0.60	3.0
8000 Hz	0.1	0.0	0.2	0.70	3.0

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

PM-598-SLM-01 Rev.0 Issue Date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0229

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 37-139	Weighting Response curve				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	( $\pm$ dB)	( $\pm$ dB)
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.3
500 Hz	-0.1	0.0	0.0		1.3
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5.0
16000 Hz	-0.1	-0.1	-0.1		<5, -0.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF	ERR		
FAST / 37-139				0.2	0.2
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF	ERR		
37-139 / A				0.2	0.1
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Log	114.00	114.0	0.0		

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

FM-709-01.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0229

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.1	0.3
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated REF (dB)	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
STD dB	(dB)	(dB)	(dB)	0.3	1.1
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	93.9	-0.1		
89.00	89	88.9	-0.1		
84.00	84	83.9	-0.1		
79.00	79	78.9	-0.1		
74.00	74	73.9	-0.1		
69.00	69	68.9	-0.1		
64.00	64	63.9	-0.1		
59.00	59	58.9	-0.1		
54.00	54	53.9	-0.1		
49.00	49	48.9	-0.1		
44.00	44	44.0	0.0		
39.00	39	39.2	0.2		
34.00	34	34.1	0.1		

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

FM-709-01.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0229

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF	ERR		
FAST / A				0.3	1.1
UUC Range	(dB)	(dB)	(dB)		
43-139	43.2	42.8	-0.4		
	114	114.0	0.0		

10. Tone burst response

UUC Setting	STD	Anticipated Toneburst (dB)	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
			REF	ERR		
A / 37-139					0.3	1.0
UUC Time Response	(dB)	(dB)	(dB)	(dB)		
Fast	200	133.0	134.9	-0.1		
	2	138.0	137.6	-0.4		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.0, -5.0
Slow	200	128.6	128.3	-0.3		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
SEL	200	129.0	129.0	0.0		1.0
	2	109.0	108.8	-0.1		+1.0, -2.5
	0.25	100.0	100.0	0.0		+1.0, -5.0

11. Peak C Sound level

UUC Setting	Anticipated REF (dB)	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / C / 95-142				0.2	2.0
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.7	-0.70		
Positive half cycle	136.4	136.2	-0.20		
Negative half cycle	136.4	136.2	-0.20		

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

FM-709-01.34-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-103  
Request No : Req-2022-0229

12. Overload indication

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.2	1.5
Positive one-half cycle	141.7		
Negative one-half cycle	141.8		
Deviated	-0.1		

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.1	0.3
Initial	138.0		
Final	138.0		
Deviated	0.0		

End of Certificate

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

FM-709-01.34-01 Rev.0 Issue date 01/07/21

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Certificate No.: 22-ACT-033

Request No.: Req-2022-0004

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	43.2	43.4	0.2	1.1
	114	114.0	0.0	1.3

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
A / 37-139	Toneburst	Ref	UUC	ERR	
UUC Tone Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	1
	2	118.0	117.8	-0.1	+1.0, -2.5
	0.25	109.0	108.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	109.0	-0.1	+1.0, -5.0
	200	129.0	129.0	0.0	1
SEL	2	109.0	109.1	+0.1	+1.0, -2.5
	0.25	106.0	106.0	-0.1	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C: 95-142	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	138.3	-0.88	3.0
Positive half cycle	136.4	138.1	-0.39	2.0
Negative half cycle	136.4	136.1	-0.39	2.0

The results related only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

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Certificate No.: 22-ACT-033

Request No.: Req-2022-0004

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Positive over-half cycle	142.3		
Negative over-half cycle	142.0		
Deviated	0.3	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3006-27 FAX: 0-2719-9464



Cert. No.: 22CH60

Page.: 1 of 3

## Certificate of Calibration

Equipment: pH Meter  
Manufacturer: EcoSense  
Model: pH100A  
Serial No.: JC03354  
ID No.: UAE.EFM.063/2562(ENV.pH 03/62)  
Condition As-Received: Used Item  
Received Date: 12 January 2022  
Calibration Date: 13 January 2022  
Reference: 2201-0350WSC-1  
Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260  
Ambient Temperature: (25 ± 2.5) °C  
Relative Humidity: (50 ± 15) %  
Calibration Procedure: In-house method.  
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by: Warakorn Lerngagrakul

Approved by:

( ) Matee Butkruea  
( ) Saithip Meangmai  
( ) Warakorn Lerngagrakul

Issue Date: 17 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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Cert. No.: 22CH60

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard instrument	Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022	
2) Ref. Standard Thermometer	4962054	110RC044	21H1201	26 Oct 2022	

This certification is traceable to the international system of unit maintained at:  
- Traceable to National Institute of Metrology (Thailand), NIIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	766820	23 Sep 2023
pH 6.962	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	04 Sep 2022

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

Calibration Results

Function: mV Measurement

Performing standard curve by Fluke at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
	pH	mV	mV	(± mV)	k
pH Meter S/N: JC03354	4.00	177.48	177	4.01	2.00
	7.00	0.00	0	7.00	2.00
	7.00	0.00	0	7.00	2.00
	10.00	-177.48	-178	-0.01	2.00

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Cert.No.: 22CH60  
Page.: 3 of 3

#### Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( $\pm$ )	Coverage factor $\kappa$
pH Electrode S/N:200729SIA605377	4.008	4.01	144	0.0079	2.00
	6.982	6.98	-28	0.011	2.00
	6.982	6.98	-27	0.0099	2.00
	10.015	10.01	-200	0.0096	2.00

Function : Temperature Measurement

( $^{\circ}$ ) Without adjustment

This equipment was connected with Temperature Probe;

Model :  
Serial No. : 200729SIA605377  
Dimension of probe;  
Length : 112 mm  
Diameter : 12 mm  
Immersion Depth : 100 mm

Calibration Point ( $^{\circ}$ C)	Standard Temperature ( $^{\circ}$ C)	UUC Reading ( $^{\circ}$ C)	Error ( $^{\circ}$ C)	Uncertainty of measurement ( $\pm$ $^{\circ}$ C)	Coverage factor $\kappa$
25.0	25.003	25.1	0.097	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
35.0	35.004	35.0	-0.004	0.13	2.00

Remark : - UUC = Unit Under Calibration

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

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#### Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Name :  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Certificate No : 22-APM-040  
Request No : Req-2022-0798

#### Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator  
Manufacturer : TSI  
Model : 4146  
Serial Number : 4146170009  
ID : UAE-PM-1012561  
Location of Calibration : LAB 4 AIR VELOCITY METER  
Serial Model :  
Serial Number :

#### Calibration Environment and Details

Temperature :  $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$   
Humidity :  $55\%RH \pm 20\%RH$   
Barometric Pressure :  $1013.9\text{hPa} \pm 10\text{hPa}$   
Received Date : 14 February 2022  
Calibration Date : 22 March 2022  
Calibration Procedure : In-house method CP-APM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Standard flow	19031011003	Standard	20 May 2022
Air Flow Meter	Calibrator 3 High flow	18301012012	Standard	21 May 2022

#### Traceability :

This certificate provides traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI).

#### Note :

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

Calibration By :  
Mr. Noppadol Luangrat  
Service Calibration Engineer

Approved By :  
Mr. Pakk Muthavorn  
Calibration Engineer Supervisor  
Issue Date : 22 March 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
PM-708-APM-01 Rev.02 Issue date 01/07/19

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Certificate No : 22-APM-040  
Request No : Req-2022-0798

#### Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(L/min)	(L/min)	(L/min)	(L/min)	(L/min)
0.01	0.01999	0.021	-0.00111	0.00072
0.01	0.00644	0.051	-0.00036	0.00094
0.1	0.1012	0.103	-0.0018	0.0017
0.2	0.1961	0.199	-0.0029	0.0028
0.5	0.5057	0.511	-0.0053	0.0074
1.0	0.992	0.983	0.009	0.018
1.7	1.66	1.666	0.006	0.03
2.0	1.99	1.975	0.015	0.03

#### Note

STD : Standard

UUC : Unit Under Calibration

Date of Certificate

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

PM-708-APM-01 Rev.02 Issue date 01/07/19

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
514/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT, BANGKOK 10250  
TEL: 0-2713-3093-34 FAX: 0-2713-3484



#### Certificate of Calibration

Certificate No. : 22P2723  
Page : 1 of 2

Equipment : Aneroid Barometer  
Manufacturer : Barigo  
Model : 111MS  
Serial No. :  
ID No. : UAE-EMA2.0682552  
Condition As-Received : Used Item  
Received Date : 20 July 2022  
Calibration Date : 22 July 2022  
Reference : 2207-0584WSC  
Ambient Temperature :  $(23 \pm 2)^{\circ}\text{C}$   
Relative Humidity :  $(50 \pm 15)\%$   
Atmospheric Pressure : 1010 mbar

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Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260

Procedure used : The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CPNP10, using "DKD-R 6-1; Calibration of Pressure Gauges, Edition 03/2014" as a guideline.

#### Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP142	1422505048	MP-0076-22	02 May 2023

- This instrument was installed in vertical orientation and center of the dial was used as the reference level.
- This result of calibration was made on requested at the point specified by customer.
- Scale and conversion factor is 1 kPa = 7.50062 mmHg.
- This result of calibration instrument was in absolute pressure.
- This instrument was used clean air as pressure media.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certification is traceable to the International System of Unit maintained at - National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Assamree  
Issue Date : 25 July 2022

Approved Signatory :  
Phalinee Pratsaprat  
Sura Suwanmool  
Attapol Panorach

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Cert. No.: 22P9723  
Page: 2 of 2

Result of calibration: Without adjustment  
Function: Absolute Pressure Measurement

Range: 720 mmHg to 770 mmHg  
Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	717.72	728.35	738.91	749.50	761.32	771.90
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0
Error (mmHg)	2.28	1.65	1.09	0.50	-1.32	-1.90

Decreasing Pressure

Applied Pressure (mmHg)	771.89	761.01	749.89	738.98	728.25	717.58
UUC* Indication (mmHg)	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-1.89	-1.01	-0.11	1.12	1.75	2.42

The uncertainty of measurement was  $\pm 0.24$  mmHg

\* UUC = Unit Under Calibration

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

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a 1118532



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES  
134/4 PATTANAKARN ROAD SOI 18, MUANGJANG, MUANGJANG, BANGKOK 10200  
TEL. 0-2717-0000-24 FAX. 0-2718-0484



## Certificate of Calibration

Certificate No.: 22H1090  
Page: 1 of 2

Equipment: Digital Thermo-Hygrometer

Manufacturer: Testo

Model: 608-H1

Serial No.: 34843033

ID No.: UAE.ANV.1352550

Condition As-Received: Used Item

Received Date: 21 September 2022

Calibration Date: 23 September 2022

to 27 September 2022

Reference: 2209-0729W5C

Ambient Temperature:  $(25 \pm 3) ^\circ\text{C}$

Relative Humidity:  $(50 \pm 20) \%$

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 2: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prachinong, Bangkok 10280

Procedure used: Calibration were conducted using in-house calibration procedure CP-M03 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

### Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygro-M2 Dew Point Monitor	5112	2380185	20703	02 Aug 2023
2) Standard Humidity/Temperature Muler	400	10240757	TH-0125-21	13 Dec 2022

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

3. This Certification is traceable to the International System of Unit maintained at-

-National Institute of Standards and Technology (NIST), The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Viporn Tantiyawuti  
Issue Date: 29 September 2022

Approved Signatory:

[Signature]

[Signature]

[Signature]

[Signature]

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a 0298131



Cert. No.: 22H1090  
Page: 2 of 2

Result of Calibration:

Function:

Humidity measurement

Without Adjustment

Reference Temperature [°C]	Standard Humidity [%R.H.]	UUC* Reading [%R.H.]	Error [%R.H.]	Uncertainty of Measurement [%R.H.]
25.0	40.1	44.7	4.6	1.3
25.0	50.1	53.4	3.3	1.8
25.0	60.0	62.7	2.7	1.8
25.0	70.2	71.9	1.7	1.8

Result of Calibration:

Function:

Temperature measurement

Without Adjustment

Standard Temperature [°C]	UUC* Reading [°C]	Error [°C]	Uncertainty of Measurement [°C]
15.02	15.1	0.08	0.42
20.03	20.0	-0.03	0.42
25.02	25.0	-0.02	0.42
30.03	29.9	-0.13	0.42
40.03	39.7	-0.33	0.42

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2.00$ , providing confidence level approximately 95%.

-000-

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a 1128756

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7130 MOO 15, BOE SUNTANAKORN 11 TAMBON BANG KAEHI,  
AMPHOE BANG PHU BANGKOK PROVINCE 10140 THAILAND  
TEL: 0800-2110-9960-1 FAX: 0800-2110-7140



## Certificate of Calibration

Customer:

Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prachinong, Bangkok 10280

Certificate No.: 22-ACT-033

Request No.: Req-2022-0891

### Unit Under Calibration Details

Measurement Item: Noise detector

Manufacturer: SVANTEK

Model: SV104

Serial Number: 81925

ID: UAE.FPM.3652564

Resolution: 0.1 dB

Microphone Class: 2

Microphone Model: SV27

Microphone S/N: 96802

Preamplifier Model: -

Preamplifier S/N: -

Instrument Status: Used

### Calibration Environment and Details

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

Humidity:  $50 \pm 20 \% \text{RH}$

Barometric Pressure:  $1013 \text{ hPa} \pm 10 \text{ hPa}$

Received Date: 14 January 2022

Calibrated Date: 21 January 2022

Calibration Procedure: In-house method CP-NDM-01 based on IEC 61252: 2017

Location of Calibration: Lab Account

### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multi-frequency Calibrator	Quest	Quest-01	184372	14 June 2022	TS1
Standard Microphone	GRAS	40AN	184373	15 September 2022	GRAS
Size Generator	Scottek	Scottek401	131	13 October 2022	WK Electric
Time	EXTICH	-	05-ACT	29 March 2022	TFA

Note:

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

Calibrated By: [Signature]

Mr. Nopphon Luangrat

Calibration Officer

Approved By: [Signature]

Mr. Park Mahagoon

Calibration Engineer Supervisor

Issue Date: 21 January 2022

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Certificate No : 22-ACT-033

Request No : Req-2022-0091

#### 1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa <sup>1</sup> /s)	UUC (Pa <sup>1</sup> /s)	Error (%)		
FAST / A / 55-140	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
1000 Hz 114 dB	120.00	120	3.23	3.20	-0.93	3.0	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

#### 2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY (± dB)	Tolerances Limit (± dB)
	A	C		
FAST / 55-140	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(± dB)	(± dB)
90 Hz	-0.3	-0.3	0.40	2.0
125 Hz	-0.2	-0.2	0.40	1.5
250 Hz	-0.2	-0.1	0.40	1.5
500 Hz	-0.2	-0.2	0.40	1.5
1000 Hz	0.0	0.0	0.40	=
2000 Hz	0.4	0.5	0.40	2.0
4000 Hz	0.2	0.3	0.40	3.0
8000 Hz	-1.8	-1.9	0.40	5.0

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Certificate No : 22-ACT-033

Request No : Req-2022-0091

#### 3. Linearity of response to steady signals

##### a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High											
	Ref	(dB)	95.0	80.0	95.0	100.0	110.0	114.0	120.0	130.0	140.0	145.0
1000 Hz	Level A	(dB)	54.2	40.3	95.1	100.1	110.1	114.1	120.1	130.1	140.1	145.1
	Error	(dB)	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	Level A	(dB)	54.2	40.3	95.1	100.1	110.1	114.1	120.1	130.1	140.1	145.1
8000 Hz	Level A	(dB)	88.8	88.8	108.8	112.8	118.8	128.8	138.8	148.8	158.8	168.8
	Error	(dB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Level A	(dB)	88.8	88.8	108.8	112.8	118.8	128.8	138.8	148.8	158.8	168.8
63 Hz	Level A	(dB)	87.8	87.8	107.8	111.8	117.8	127.8	137.8	147.8	157.8	167.8
	Error	(dB)	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	Level A	(dB)	87.8	87.8	107.8	111.8	117.8	127.8	137.8	147.8	157.8	167.8
Tolerances Limit	(dB)	1.0										
UNCERTAINTY	(dB)	0.27										

##### b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa <sup>1</sup> /s)	UUC (Pa <sup>1</sup> /s)	Error (%)		
FAST / A / 55-140	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
1000 Hz 119 dB	27	27	0.30	0.30	0.00	4.3	-21, +26
1000 Hz 119 dB	45	45	0.30	0.30	0.00		
1000 Hz 119 dB	90	90	1.00	1.01	+1.00		
1000 Hz 119 dB	180	180	2.00	2.02	+1.00		
1000 Hz 120 dB	36	36	4.00	4.01	+0.25	3.8	-21, +26
1000 Hz 120 dB	72	72	8.00	8.05	+0.63		
1000 Hz 120 dB	90	90	10.00	10.13	+1.30		
1000 Hz 120 dB	180	180	20.00	20.22	+1.10		
1000 Hz 120 dB	360	360	40.00	40.34	+0.85	3.8	-21, +26
1000 Hz 120 dB	720	720	80.00	80.49	+0.61		

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Certificate No : 22-ACT-033

Request No : Req-2022-0091

#### 4. Response to short duration

##### a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa <sup>1</sup> /s)	UUC (Pa <sup>1</sup> /s)	Error (%)		
FAST / A / 55-140	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
4000 Hz 95 dB	2840	2840	1.00	0.99	-0.01	0.01	-0.20, +0.41

##### b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa <sup>1</sup> /s)	UUC (Pa <sup>1</sup> /s)	Error (%)		
FAST / A / 55-140	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Burst 1 ms, 91 dB	2840	2840	1.00	0.99	-1.00	3.0	-21, +26
Burst 1 ms, 100 dB	900	900	1.00	1.00	0.00		-21, +41
Burst 1 ms, 100 dB	143	143	1.00	1.00	0.00		-21, +41

#### 5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa <sup>1</sup> /s)	UUC (Pa <sup>1</sup> /s)	Error (%)		
FAST / A / 55-140	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa <sup>1</sup> /s)	(Pa <sup>1</sup> /s)	(%)	(%)	(%)
Continuous Rectangle +	T		10.00	10.00	0.00	2.4	-21, +26
Continuous Rectangle -			10.00	10.00	0.00		

\* Indicates non accredited

Ead of Certificate

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#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Certificate No : 21-ACT-326

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok,

Request No : Req-2021-0994

Prachinong, Bangkok 10260

##### Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Class : 1

Manufacturer : SVANTEK

Range : 94, 114 dB / 1000 Hz

Model : SV36

Instrument Status : Used

Serial Number : 107224

ID : UAE.EFM.171/2564

##### Calibration Environment and Details

Temperature : ( 23 ± 2 °C )

Humidity : ( 50 ± 20 %RH )

Barometric Pressure : ( 1013 ± 0.0 hPa )

Received Date : 22 July 2021

Calibration Date : 24 August 2021

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	14 May 2022
THD Multimeter	2015	1047765	NIMT	21 January 2022

##### Traceability

This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

##### Note

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

Calibrated By :

Mr. Noppadol Laungant

Service Calibration Engineer

Approved By :

Mr. Pait Mathavorn

Calibration Engineer Supervisor

Issue Date :

24 August 2021

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Certificate No. : 21-ACT-326  
Request No. : Rq-2021-0994

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.06	0.06	-	-	0.11	0.25
114 dB / 1000 Hz	114.13	0.13	-	-	0.11	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	999.96	0.004	-	-	0.10	0.70
114 dB / 1000 Hz	999.98	0.002	-	-	0.10	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (dB)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Error (%)	Measured (%)	Error (%)		
94 dB / 1000 Hz	0.43	-	-	-	0.40	2.5
114 dB / 1000 Hz	0.35	-	-	-	0.40	2.5

Note :

- Acceptance limit was IEC60942 2017 Class 1
- The calibration results include the calibration pressure correction
- The calibration results include the microphone volume correction

End of Calibration

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SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY



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

Cert. No. : ACL22077  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-62 / Microphone UC-39L / Preamplifier NH-26  
Serial No. : 00391458 / 01748 / 01553  
ID No. : -

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

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

Received Date : 18 JANUARY 2022  
Calibration Date : 21-25 JANUARY 2022  
Date of issue : 28 JANUARY 2022

Calibrated by : Nuthakorn Pisutpaisan

Approved by : *T. Petchur*  
( Thanakul Petchurai )

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

QF-TS12-04-04-020664

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SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2014) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard instruments .

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY4801/0/6	EP-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EP-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	I-15180/25251-1	15-Sep-22
Programmable Attenuator	MAJ-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA	34500495	AA-3003-21	16-Feb-22

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

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

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

QF-TS12-04-04-020664

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SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.4	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

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## Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.96)	94.0	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
14.7

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

Frequency Weighting	Measure value ( dB )
A-weight	11.2
C-weight	15.4
Flat	23.3

## 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.5	0.5	± 1.0
1000	0.4	0.3	0.3	± 0.7
8000	0.4	0.4	0.4	+ 1.5, - 2.5

QF-TS12-04-04-020664

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T. Reth

## Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	-0.1	0.0	0.0	±1.0
4000	-0.1	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long-term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A-weight	94.0	94.0	0.0	±0.1

QF-TS12-04-04-020664

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T. Reth

## Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.1	0.1	±0.8
136.0	136.1	0.1	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

QF-TS12-04-04-020664

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## Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±0.8

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	±5.0-5.0
	2	8	117.0	116.9	-0.1	±0.0-2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	±5.0-5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	±5.0-5.0
SEL	2	8	108.0	108.0	0.0	±0.0-2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	*
One	136.4	135.7	-0.7	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	*
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Reth

Continuation of Calibration Certificate

Cert. No. : ACL22077  
Job No. : VC65AC0044  
Pages : 8 of 8

11. Overload indication

Measured value ( dB )		Deviated Value	Acceptance Limits
Positive	Negative		
one-half cycle	one-half cycle	( dB )	( dB )
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A-weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Petch

451-451/1 Srinthom Rd., Bangpoom, Bangkok 10700 THAILAND  
Tel:0-2435-3800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22078  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-62/ Microphone UC-59L / Preamplifier NH-26  
Serial No. : 90391494 / 01184 / 01589  
ID No. : \*

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

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

Received Date : 18 JANUARY 2022  
Calibration Date : 21-25 JANUARY 2022  
Date of Issue : 28 JANUARY 2022

Calibrated by : Nathakorn Pisupaisan

Approved by :

T. Petch  
( Thanakul Petchurai )

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

QF-TS12-04-04-020664

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL 22078  
Job No. : VC65AC0044  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY4801/0/6	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY5320104	EEL-BP 05/02/64	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP 03/02/64	08-Feb-22
Digital Multimeter	34461A	MY60624273	1-15180/25251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34360495	AA-3003-21	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR)

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22078  
Job No. : VC65AC0044  
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.4	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Petch

## Continuation of Calibration Certificate

Cert. No. : ACL22078  
Job No. : VC65AC0044  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.96)	94.0	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
14.6

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

Frequency Weighting	Measured value ( dB )
A-weight	11.0
C-weight	16.1
Flat	24.0

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.0
1000	0.3	0.2	0.2	± 0.7
8000	0.6	0.6	0.6	-1.5, - 2.5

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Retoh

## Continuation of Calibration Certificate

Cert. No. : ACL22078  
Job No. : VC65AC0044  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.1	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long-term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A-weight	94.0	94.0	0.0	± 0.1

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Retoh

## Continuation of Calibration Certificate

Cert. No. : ACL22078  
Job No. : VC65AC0044  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.1	0.1	±0.8
136.0	136.1	0.1	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.1	0.1	±0.8
132.0	132.1	0.1	±0.8
131.0	131.0	0.0	±0.8
129.0	129.1	0.1	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.1	0.1	±0.8
109.0	109.1	0.1	±0.8
104.0	104.1	0.1	±0.8
99.0	99.1	0.1	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.1	0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	25.0	0.0	±0.8

QF-TS12-04-04-020664

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T. Retoh

## Continuation of Calibration Certificate

Cert. No. : ACL22078  
Job No. : VC65AC0044  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Auto	94.0	94.0	0.0	±0.8

## 9. Tone burst response

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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±
One	136.4	136.6	-0.4	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

T. Retoh



## Continuation of Calibration Certificate

Cert. No. : ACI-22078  
Job No. : VC6SAC0044  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

Frequency Weighting	SL M Display at initial ( dB )	SL M Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0

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

End of Calibration Certificate

QF-TS17-04-04-020664

เอกสารไม่ควบคุม

T. R. R.

## Certificate of Calibration

## Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok  
10260Certificate No : 22-ACT-103  
Request No : Req-2022-0230

## Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Model : 375A04  
Manufacturer : LARSON DAVID  
Model : LA22  
Microphone S/N : 328668  
Serial Number : 0005402  
Preamplifier Model : PHMLxT2C  
ID : UAE-EPM038/2564  
Preamplifier S/N : 071340  
Resolution : 0.1 dB  
Intensities Status : Used

## Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic test  
Location of Calibration : Lab Acoustic

## Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	100273	13 September 2022	GRAS
Multifrequency Calibrator	Quest	Questcal	EFA000234	14 June 2022	TSI
Audio Generator	Svantek	Svan401	131	18 October 2022	WK Electric

## Note

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

Calibrated By :

Mr. Nopphon Luangjai  
Calibration Officer

Approved By :

Mr. Pait Mahasom  
Calibration Engineer Supervisor

Issue Date : 11 February 2022

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

PM-709-SLM-01 Rev.01 Issue date: 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0230

## 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY ( ± dB )	Acceptance Limit ( ± dB )
FAST / A / 37-139		Level	UUC	ERR	UUC		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz (114.00 dB)	113.85	114.0	+0.15	113.9	0.05	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN 58079

## 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	( dB )	( ± dB )
A	28.1	0.10

## 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	( dB )	( ± dB )
A	28.1	0.10
C	27.8	0.10
Z	34.4	0.10

## 4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( ± dB )	Acceptance Limit ( ± dB )
	A	C	Z		
FAST / 37-139					
STD Setting	( dB )	( dB )	( dB )		
125 Hz	0.0	0.1	0.1	0.20	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.9	0.9	1.0	0.60	3.0
8000 Hz	0.7	0.7	0.8	0.70	3.0

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

PM-709-SLM-01 Rev.01 Issue date: 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0230

## 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( ± dB )	Acceptance Limit ( ± dB )
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		3.0
16000 Hz	-0.1	-0.1	-0.1		>5, -INF

## 6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY ( ± dB )	Acceptance Limit ( ± dB )
		UUC ( dB )	ERR ( dB )		
FAST / 37-139					
UUC Weighting	( dB )	( dB )	( dB )		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD REF	Measured		UNCERTAINTY ( ± dB )	Acceptance Limit ( ± dB )
		UUC ( dB )	ERR ( dB )		
37-139 / A					
UUC Time Response	( dB )	( dB )	( dB )		
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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

PM-709-SLM-01 Rev.01 Issue date: 01/07/21

เอกสารไม่ควบคุม



Certificate No : 22-ACT-103

Request No : Req-2022-0230

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	$(\pm \text{dB})$	$(\pm \text{dB})$
STD Setting	(dB)		
Initial	134.0		
Final	134.0		
Deviated	0.0	0.1	0.3

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	$(\pm \text{dB})$	$(\pm \text{dB})$
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0	0.3	1.1
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.0	0.0		
39.00	39	39.3	0.3		
34.00	34	34.3	0.3		

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

PM-708-01.34-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-103

Request No : Req-2022-0230

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	$(\pm \text{dB})$	$(\pm \text{dB})$
UUC Range	(dB)	(dB)	(dB)		
37-139	43.2	42.9	-0.3	0.3	1.1
	114	114.0	0.0		

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit
A / 37-139	Timeburst	Ref	UUC	ERR	$(\pm \text{dB})$	$(\pm \text{dB})$
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	135.0	0.0	0.3	1.0
	2	118.0	117.7	-0.3		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	200	129.8	129.0	0.0		1.0
SEL	2	109.0	109.0	0.0		+1.0, -2.5
	0.25	100.0	99.0	-0.1		+1.5, -5.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	UUC	ERR	$(\pm \text{dB})$	$(\pm \text{dB})$
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.7	-0.70	0.2	3.0
Positive half cycle	136.4	136.1	-0.30		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

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

PM-708-01.34-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-103

Request No : Req-2022-0230

#### 12. Overload Indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	$(\pm \text{dB})$	$(\pm \text{dB})$
STD Setting	(dB)		
Positive one-half cycle	142.2		
Negative one-half cycle	142.3		
Deviated	-0.1	0.2	1.5

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	$(\pm \text{dB})$	$(\pm \text{dB})$
STD Setting	(dB)		
Initial	136.0		
Final	135.0		
Deviated	0.0	0.1	0.3

End of Certificate

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

PM-708-01.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 22-ACT-100

Request No : Req-2022-0234

##### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Class : 2  
Manufacturer : LARSON DAVIS  
Microphone Model : 375A04  
Model : LyT2  
Microphone S/N : 320609  
Serial Number : 0006037  
Preamplifier Model : PRM14T2C  
ID : UAEFPM0482564  
Preamplifier S/N : 071532  
Resolution : 0.1 dB  
Instrument Status : Used

##### Calibration Environment and Details

Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
Humidity :  $50\% \text{RH} \pm 20\% \text{RH}$   
Barometric Pressure :  $\geq 1013 \text{ hPa} \pm 10 \text{ hPa}$   
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests  
Location of Calibration : Lab Acoustic

##### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	148273	15 September 2022	GRAS
Multi-frequency Calibrator	Quant	Quant-4	EFA000234	14 June 2022	TSR
Audio Generator	Svsmik	Svsm401	131	18 October 2022	WK Electric

##### Note

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

Calibrated By :



Mr. Noppadol Luangrat  
Calibration Officer

Approved By :



Mr. Patch Mahavatum  
Calibration Engineer Supervisor

Issue Date : 11 February 2022

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

PM-708-01.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-100  
Request No : Req-2022-0234

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	0.20	0.3

Note : Absolute sensitivity was established by the use of Sennheiser brand SVANTEK, Model SV 35A, SN:50079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.9	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.8	0.10
C	28.8	0.10
Z	34.3	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)		
STD Setting	0.0	0.1	0.0	0.50	2.0
125 Hz	0.0	0.0	0.0	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.5	0.6	0.6	0.60	3.0
8000 Hz	0.5	0.5	0.6	0.70	3.0

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

FSM-700-SLM-01 Rev.01 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-100  
Request No : Req-2022-0234

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 37-139	A (dB)	C (dB)	Z (dB)		
STD Setting	0.0	0.0	0.0	0.2	2.0
63 Hz	-0.2	0.0	0.0		1.5
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	0.0	0.0		3
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 37-139	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0	0.2	0.2

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
37-139 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.1	0.1
Slow	114.00	114.0	0.0	0.1	0.1
Log	114.00	114.0	0.0	0.1	0.1

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FSM-700-SLM-01 Rev.01 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-100  
Request No : Req-2022-0234

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviant	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
140.00	140	140.0	0.0	0.3	1.1
139.00	139	139.0	0.0		1.1
138.00	138	138.0	0.0		1.1
137.00	137	137.0	0.0		1.1
136.00	136	136.0	0.0		1.1
135.00	135	135.0	0.0		1.1
134.00	134	134.0	0.0		1.1
133.00	133	133.0	0.0		1.1
132.00	132	132.0	0.0		1.1
131.00	131	131.0	0.0		1.1
130.00	130	130.0	0.0		1.1
129.00	129	129.0	0.0		1.1
128.00	128	128.0	0.0		1.1
127.00	127	127.0	0.0		1.1
126.00	126	126.0	0.0		1.1
125.00	125	125.0	0.0		1.1
124.00	124	124.0	0.0		1.1
123.00	123	123.0	0.0		1.1
122.00	122	122.0	0.0		1.1
121.00	121	121.0	0.0		1.1
120.00	120	120.0	0.0		1.1
119.00	119	119.0	0.0		1.1
118.00	118	118.0	0.0		1.1
117.00	117	117.0	0.0		1.1
116.00	116	116.0	0.0		1.1
115.00	115	115.0	0.0		1.1
114.00	114	114.0	0.0		1.1
113.00	113	113.0	0.0		1.1
112.00	112	112.0	0.0		1.1
111.00	111	111.0	0.0		1.1
110.00	110	110.0	0.0		1.1
109.00	109	109.0	0.0		1.1
108.00	108	108.0	0.0		1.1
107.00	107	107.0	0.0		1.1
106.00	106	106.0	0.0		1.1
105.00	105	105.0	0.0		1.1
104.00	104	104.0	0.0		1.1
103.00	103	103.0	0.0		1.1
102.00	102	102.0	0.0		1.1
101.00	101	101.0	0.0		1.1
100.00	100	100.0	0.0		1.1
99.00	99	99.0	0.0		1.1
98.00	98	98.0	0.0		1.1
97.00	97	97.0	0.0		1.1
96.00	96	96.0	0.0		1.1
95.00	95	95.0	0.0		1.1
94.00	94	94.0	0.0		1.1
93.00	93	93.0	0.0		1.1
92.00	92	92.0	0.0		1.1
91.00	91	91.0	0.0		1.1
90.00	90	90.0	0.0		1.1
89.00	89	89.0	0.0		1.1
88.00	88	88.0	0.0		1.1
87.00	87	87.0	0.0		1.1
86.00	86	86.0	0.0		1.1
85.00	85	85.0	0.0		1.1
84.00	84	84.0	0.0		1.1
83.00	83	83.0	0.0		1.1
82.00	82	82.0	0.0		1.1
81.00	81	81.0	0.0		1.1
80.00	80	80.0	0.0		1.1
79.00	79	79.0	0.0		1.1
78.00	78	78.0	0.0		1.1
77.00	77	77.0	0.0		1.1
76.00	76	76.0	0.0		1.1
75.00	75	75.0	0.0		1.1
74.00	74	74.0	0.0		1.1
73.00	73	73.0	0.0		1.1
72.00	72	72.0	0.0		1.1
71.00	71	71.0	0.0		1.1
70.00	70	70.0	0.0		1.1
69.00	69	69.0	0.0		1.1
68.00	68	68.0	0.0		1.1
67.00	67	67.0	0.0		1.1
66.00	66	66.0	0.0		1.1
65.00	65	65.0	0.0		1.1
64.00	64	64.0	0.0		1.1
63.00	63	63.0	0.0		1.1
62.00	62	62.0	0.0		1.1
61.00	61	61.0	0.0		1.1
60.00	60	60.0	0.0		1.1
59.00	59	59.0	0.0		1.1
58.00	58	58.0	0.0		1.1
57.00	57	57.0	0.0		1.1
56.00	56	56.0	0.0		1.1
55.00	55	55.0	0.0		1.1
54.00	54	54.0	0.0		1.1
53.00	53	53.0	0.0		1.1
52.00	52	52.0	0.0		1.1
51.00	51	51.0	0.0		1.1
50.00	50	50.0	0.0		1.1
49.00	49	49.0	0.0		1.1
48.00	48	48.0	0.0		1.1
47.00	47	47.0	0.0		1.1
46.00	46	46.0	0.0		1.1
45.00	45	45.0	0.0		1.1
44.00	44	44.0	0.0		1.1
43.00	43	43.0	0.0		1.1
42.00	42	42.0	0.0		1.1
41.00	41	41.0	0.0		1.1
40.00	40	40.0	0.0		1.1
39.00	39	39.0	0.0		1.1

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FSM-700-SLM-01 Rev.01 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-100  
Request No : Req-2022-0234

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
37-139	43.9	43.6	-0.3	1.1	1.1
	114	114.0	0.0	0.3	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
A / 37-139	Toneburst (ms)	Ref	UUC	ERR		
UUC Time Response		(dB)	(dB)	(dB)		
Fast	200	135.0	134.9	-0.1	0.3	1.0
	2	118.0	117.6	-0.4		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	200	129.0	129.0	0.0		1.0
SEL	2	109.0	109.1	+0.1		+1.0, -2.5
	0.25	100.0	99.9	-0.1		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / C / 95-142	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

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FSM-700-SLM-01 Rev.01 Issue date 01/07/21

เอกสารไม่ควบคุม



Certificate No : 22-ACT-100  
Request No : Req-2022-0234

12. Overload indication

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	142.8		
Negative one-half cycle	142.7		
Deviated	0.1		

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviated	0.0		

End of Certificate

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sakumvit Road, Bangchak, Pratumwan, Bangkok 10560  
Certificate No : 22-ACT-100  
Request No : Req-2022-0229

Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LxT2  
Serial Number : 000196  
ID : UAE-EFM-033-2564  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 229330  
Preamplifier Model : PFM1aTIC  
Preamplifier S/N : 073812  
Instrument Status : Used

Calibration Environment and Details


Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
Humidity :  $50\% \pm 20\%$   
Barometric Pressure :  $1013 \text{ hPa} \pm 10 \text{ hPa}$   
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188773	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-ul	EFA000234	14 Jan 2022	TSI
Audio Generator	Srunk	Srunk-01	131	18 October 2022	WK Electric

Note

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

Calibrated By :   
Mr. Noppan Luangnit  
Calibration Officer

Approved By :   
Mr. Pavin Mahasorn  
Calibration Engineer Supervisor  
Issue Date : 11 February 2022

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust			Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	Level	UUC	ERR		UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)		(dB)	(dB)		
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.01	0.20		

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SYNTEK, Model SV 35A, S/N:58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting		
A	27.8	0.30

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting		
A	27.8	0.30
C	27.3	0.30
Z	33.1	0.30

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / 37-139	A	C	Z		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.1	0.2		
1000 Hz	0.0	0.0	0.0		
4000 Hz	0.6	0.5	0.6		
8000 Hz	0.1	0.0	0.2		

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / 37-139	A (dB)	C (dB)	Z (dB)		
STD Setting				0.2	
63 Hz	-0.2	0.0	0.0		
125 Hz	-0.1	0.0	0.0		
250 Hz	-0.1	0.0	0.0		
500 Hz	-0.1	0.0	0.0		
1000 Hz	0.0	0.0	0.0		
2000 Hz	0.0	0.1	0.0		
4000 Hz	0.0	0.0	0.0		
8000 Hz	0.0	0.0	0.0		
16000 Hz	-0.1	-0.1	-0.1		

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / 37-139	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.3	
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
37-139 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

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### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	
STD dB	(dB)	(dB)	(dB)	( $\pm$ dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	68.9	-0.1	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	58.9	-0.1	1.1
54.00	54	53.9	-0.1	1.1
49.00	49	48.8	-0.1	1.1
44.00	44	44.0	0.0	1.1
39.00	39	39.2	0.2	1.1
34.00	34	34.3	0.3	1.1

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

File:709-01-M-01 Rev.0 Issue date:01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

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### 9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	( $\pm$ dB)
37-139	43.2	42.8	-0.4	1.1
	114	114.0	0.0	1.1

### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
A / 37-139	Timeburst	Ref	UUC	ERR	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	( $\pm$ dB)
Fast	200	133.0	134.9	-0.1	1.0
	2	118.0	117.6	-0.4	+1.0, -2.5
	0.25	100.0	100.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1.0
	2	109.0	108.9	-0.1	+1.0, -5.0
	200	129.0	129.0	0.0	1.0
SEL	2	109.0	108.8	-0.1	+1.0, -2.5
	0.25	100.0	100.0	0.0	+1.5, -5.0

### 11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	( $\pm$ dB)
Complete cycle	137.4	136.7	-0.70	2.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

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File:709-01-M-01 Rev.0 Issue date:01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

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### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Positive one-half cycle	141.7		
Negative one-half cycle	141.8		
Deviated	-0.1	0.2	1.5

### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

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

File:709-01-M-01 Rev.0 Issue date:01/07/21

เอกสารไม่ควบคุม



รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพอากาศ									
1	Analytical Balance (Readability 0.1 mg)	TSP  Total dust	Mettler-Toledo	AB204-S / 1128312528	Mettler-Toledo (Thailand) Ltd.	TH2058-097-040722- ACC-TH	7 Apr 22	6 Apr 23	-
2	Analytical Balance (Readability 0.1 mg)		Mettler-Toledo	AB204-S/FACT / B108115858	Mettler-Toledo (Thailand) Ltd.	TH2058-098-040722- ACC-TH	7 Apr 22	6 Apr 23	-
3	Analytical Balance (Readability 0.001 mg)		Mettler-Toledo	XP6 / B322373893	Mettler-Toledo (Thailand) Ltd.	TH2058-099-040722- ACC-TH	7 Apr 22	6 Apr 23	-
4	Gas Chromatography - Mass Spectrometer (GC-MS)	Propylene  Hexane  Ethylene	Bruker  Scion	451-GC / BR1201M099  Scion-SQ / GQS1203F021  CP8400 / BR1203M331	Thai Unique  Co.,Ltd.	SV2205/20385	19 May 22	18 May 23	-
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำ									
5	pH Meter	pH  Temperature	Mettler-Toledo	Seven Easy S20 / 1230525212	National Food Institute, Ministry of Industry, Thailand	2202093-001-01	16 Mar 22	15 Mar 23	-
6	pH Meter		Mettler-Toledo	SevenCompact S220/ C113432421	National Food Institute, Ministry of Industry, Thailand	2203527-001-01	5 Jul 22	4 Jul 23	-
7	Analytical Balance (Readability 0.01 mg)	Suspended Solids  Total Dissolved Solids	Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	22MM210	26 Apr 22	25 Apr 23	-
8	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	22TM1490	19 Oct 22	18 Oct 23	-
9	Analytical Balance (Readability 0.1 mg)	Oil and Grease	Mettler-Toledo	XSR204 / C117635043	National Food Institute, Ministry of Industry, Thailand	2202934-001-01	13 May 22	12 May 23	-
10	BOD Incubator	Biochemical Oxygen Demand	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-

รายการใบรับรองสอบเทียบเครื่องมือหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำ									
11	COD Reactor (Heating Block)	Chemical Oxygen Demand, COD	Hanna	HI839800-02 / H018500I	Hanna Instruments (Thailand) Ltd.	HIT-2209-0184	1 Mar 22	1 Mar 23	-
12	UV-VIS Spectrophotometer	Chemical Oxygen Demand Color (ADMI)	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP22-016	31 May 22	30 May 23	-
13	UV-VIS Spectrophotometer		Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-
14	Gas Chromatography (GC)	TPH (C5-C8) TPH (C8-C16) TPH (C16-C35)	Agilent Technologies	System ID:CN11021007 7890 / CN11021007	Agilent Technologies (Thailand) Co.,Ltd.	Certificate of System Qualification GC-OQ	11 Feb 22	10 Feb 23	-
15	Gas Chromatography - Mass Spectrometer (GC-MS)	n- Hexane	Agilent Technologies	System ID: US2009M037 8890 (G3542A) / CN1945A066 5977B / US2009M037	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	13 Jun 22	12 Jun 23	-

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## Accuracy Calibration Certificate

### Customer

Company: United Analytical and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak  
City: Pracha Uthong Contact: Suret Chomok  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number: 

### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument  
Model: AD204-S Asset Number: UAE.AIR.0182030  
Serial No.: 1128313228 Terminal Model: N/A  
Building: N/A Terminal Serial No.: N/A  
Floor: 2 Terminal Asset No.: N/A  
Room: Balance Room 2 (208)

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

### Procedure

Calibration Guidelines: EURAMET cg-18 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: CPM02020  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/lean of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.5 °C End: 21.6 °C	Start: 56.1 % End: 63.2 %

As Found Calibration Date: 07-Apr-2022 Calibrator:   
As Left Calibration Date: N/A  
Issue Date: 08-Apr-2022 Approved Signatory:   
☒ Kassakorn Tassanachaisakul  
☐ Santi Jitvijon  
☐ Sursachai Sukkale

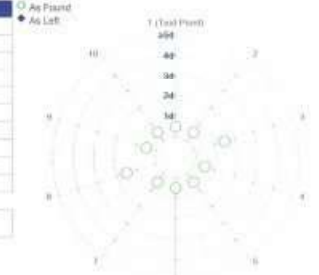
## Measurement Results

### Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9999 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0001 g	N/A
9	99.9998 g	N/A
10	100.0000 g	N/A

Standard Deviation: 0.00056 g N/A



The "1σ" in the graph represents the readability of the range interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A

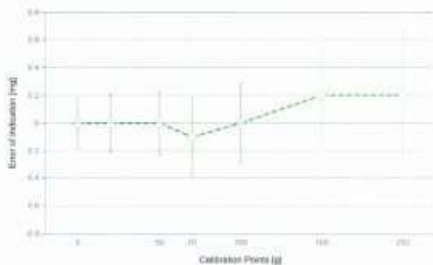
Maximum Deviation: 0.0002 g N/A



The "1σ" in the graph represents the readability of the range interval in which the test was performed.

## Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	0.1000 g	0.1000 g	0.0000 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.19 mg	2
5	10.0000 g	9.9999 g	-0.0001 g	0.20 mg	2
6	20.0000 g	20.0000 g	0.0000 g	0.21 mg	2
7	50.0000 g	50.0000 g	0.0000 g	0.23 mg	2
8	70.0001 g	70.0000 g	-0.0001 g	0.26 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.28 mg	2
10	150.0000 g	150.0000 g	0.0000 g	0.40 mg	2
11	200.0001 g	200.0000 g	-0.0002 g	0.46 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k = 2 which can be larger than 2 according to EURAMET cg-18. The value of the measured lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

### Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

#### Weight Set 1: OIML E2

Weight Set No.: W580 Date of Issue: 23-Feb-2022  
Certificate Number: C258581631 Calibration Due Date: 14-Aug-2023

#### Thermo Hygrometer

Equipment No.: B161 Date of Issue: 14-Jun-2021  
Certificate Number: 21H1220 Calibration Due Date: 01-Jun-2022

## Remarks

Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory  
Test weight by Filer pan : 1 g = 0.9999 g, 3 g = 3.0000 g, 5 g = 5.0000 g

### End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.



### Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $3.0 \cdot 10^{-6} / ^\circ\text{C}$   
Temperature range on site for the evaluation of the measurement uncertainty in use:  $3^\circ\text{C}$

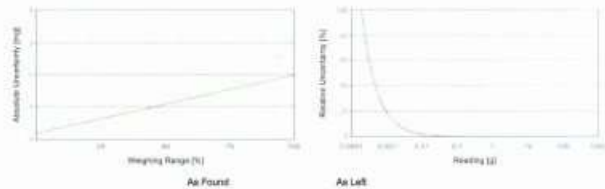
#### Linearization of Uncertainty Equation

Range	d	Max	As Found	As Left
1	0.0001 g	220 g	$U_1 = 0.18 \text{ mg} + 0.00817 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

#### Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.18 mg	0.86%
0.2200 g	0.18 mg	0.081%
2.2000 g	0.21 mg	0.0095%
22.0000 g	0.37 mg	0.0017%
220.0000 g	2.0 mg	0.00090%



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### Accuracy Calibration Certificate

#### Customer

Company: United Analyser and Engineering Consultant Co., Ltd.  
Address: 33 Soi Udom Suk 41, Sukhumvit Rd., Bang Chien  
City: Phra Khanong Contact: Suwit Chomlek  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number:

#### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument  
Model: AB204-SFACT Asset Number: UAE.AIR.018/2535  
Serial No.: B198118958 Terminal Model: N/A  
Building: N/A Terminal Serial No.: N/A  
Floor: 3 Terminal Asset No.: N/A  
Room: Reference Room 2 (20R)

Range	Max. Capacity	Readability (g)
1	220 g	0.0001 g

#### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: CPM002/201

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight. In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.6 °C End: 22.1 °C	Start: 58.0 % End: 51.9 %
As Left	Start: 22.3 °C End: 22.4 °C	Start: 48.2 % End: 55.8 %

As Found Calibration Date: 07-Apr-2022  
As Left Calibration Date: 07-Apr-2022  
Issue Date: 08-Apr-2022

Calibrator:   
Approved Signatory:   
☒ Kasornchai Tassanacharand  
☐ Santi Jirayom  
☐ Surasak Sukkote

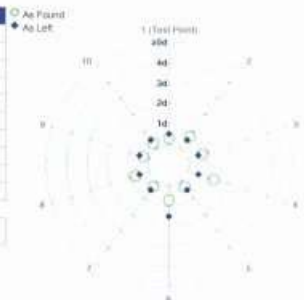
### Measurement Results

#### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0005 g	99.9999 g
2	100.0004 g	100.0000 g
3	100.0004 g	99.9999 g
4	100.0006 g	100.0000 g
5	100.0005 g	99.9999 g
6	100.0004 g	99.9998 g
7	100.0005 g	100.0000 g
8	100.0004 g	100.0000 g
9	100.0005 g	100.0000 g
10	100.0005 g	100.0000 g

Standard Deviation	0.00007 g	0.00007 g
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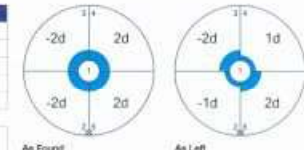
The '1' in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

#### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0005 g	100.0000 g
2	100.0003 g	99.9999 g
3	100.0003 g	99.9998 g
4	100.0007 g	100.0001 g
5	100.0007 g	100.0002 g

Maximum Deviation	0.0002 g	0.0002 g
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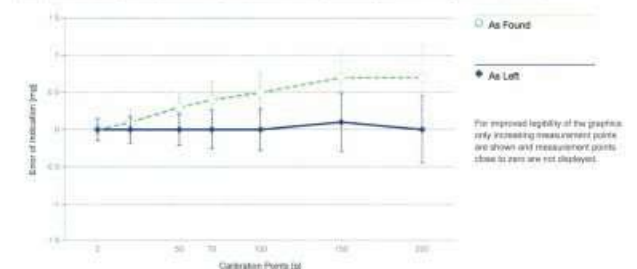


The '1' in the graph represents the readability of the range/interval in which the test was performed.

### Error of Indication

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.5000 g	0.5001 g	0.0001 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
5	10.0000 g	10.0001 g	0.0001 g	0.17 mg	2
6	20.0000 g	20.0001 g	0.0001 g	0.18 mg	2
7	50.0000 g	50.0003 g	0.0003 g	0.20 mg	2
8	70.0001 g	70.0003 g	0.0002 g	0.26 mg	2
9	100.0000 g	100.0005 g	0.0005 g	0.27 mg	2
10	150.0000 g	150.0007 g	0.0007 g	0.38 mg	2
11	200.0001 g	200.0006 g	0.0005 g	0.44 mg	2

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.5000 g	0.5000 g	0.0000 g	0.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.17 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.17 mg	2
5	10.0000 g	10.0000 g	0.0000 g	0.17 mg	2
6	20.0000 g	20.0000 g	0.0000 g	0.18 mg	2
7	50.0000 g	50.0000 g	0.0000 g	0.21 mg	2
8	70.0001 g	70.0001 g	0.0000 g	0.26 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.28 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.39 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.45 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

### Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and verified by an accredited calibration laboratory.

#### Weight Set 1: OIML E2

Weight Set No.:	W530	Date of Issue:	23-Feb-2022
Certificate Number:	C2058M1631	Calibration Due Date:	14-Aug-2023
<b>Thermo Hygrometer</b>			
Equipment No.:	81161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1220	Calibration Due Date:	01-Jun-2022

### Remarks

FACT adjustment functionality activated  
Value of the built-in weight adjusted  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decided by calibration laboratory  
Test weight by Filter pan : 1 g = 1.0000 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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### Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use	$2.5 \cdot 10^{-4} / ^\circ\text{C}$
Temperature range on site for the evaluation of the measurement uncertainty in use	3 K

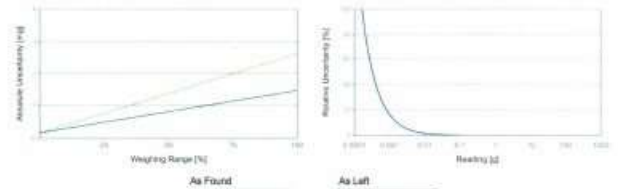
#### Linearization of Uncertainty Equation

Range	As Found	As Left
d, Max		
1 0.0001 g 220 g	$U_1 = 0.16 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$	$U_1 = 0.16 \text{ mg} + 0.00502 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

#### Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.16 mg 0.73%	0.16 mg 0.73%
0.2200 g	0.16 mg 0.074%	0.16 mg 0.073%
2.2000 g	0.16 mg 0.0084%	0.17 mg 0.0079%
22.0000 g	0.40 mg 0.0018%	0.29 mg 0.0013%
220.0000 g	2.6 mg 0.0012%	1.9 mg 0.0008%



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## Accuracy Calibration Certificate

### Customer

Company: United Analyser and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udon Suk 41, Sukhumvit Rd., Bang Chak  
City: Phra Khanong Contact: Suwit Chotnook  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number:

### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument  
Model: XPE Asset Number: UAE.AIR.0102556  
Serial No.: B322373893 Terminal Model: PAT  
Building: N/A Terminal Serial No.: B322373893  
Floor: 2 Terminal Asset No.: N/A  
Room: Balance Room 2 (200)

Range	Max. Capacity	Readability (d)
1	6.1 g	0.00001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: CPM002/00  
This calibration certificate contains measurements for As Found and As Left calibrations.  
The sensitivity span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.7 °C End: 22.8 °C Start: 54.2 % End: 53.5 %	
As Left	Start: 22.6 °C End: 22.9 °C Start: 52.0 % End: 50.5 %	

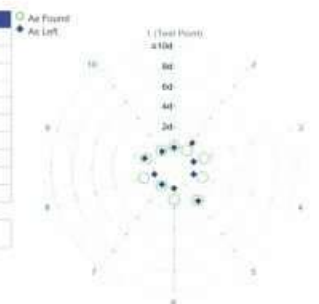
As Found Calibration Date: 07-Apr-2022 Calibration:   
As Left Calibration Date: 07-Apr-2022  
Issue Date: 08-Apr-2022  
Approved Signatory:   
☒ Kasakorn Tassachachaisakul  
☐ Sont Jitvijay  
☐ Surachet Sukkate

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### Measurement Results

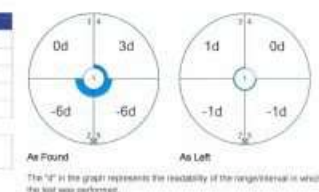
#### Repeatability

Test Load: 2 g	As Found	As Left
1	2.000007 g	2.000008 g
2	2.000007 g	2.000009 g
3	2.000008 g	2.000008 g
4	2.000008 g	2.000008 g
5	2.000005 g	2.000006 g
6	2.000004 g	2.000006 g
7	2.000007 g	2.000006 g
8	2.000009 g	2.000008 g
9	2.000006 g	2.000005 g
10	2.000007 g	2.000006 g
Standard Deviation	0.0000019 g	0.0000008 g



#### Eccentricity

Test Load: 2 g	As Found	As Left
Position		
1	2.000008 g	2.000008 g
2	2.000003 g	2.000007 g
3	2.000008 g	2.000009 g
4	2.000011 g	2.000006 g
5	2.000002 g	2.000007 g
Maximum Deviation	0.000006 g	0.000001 g



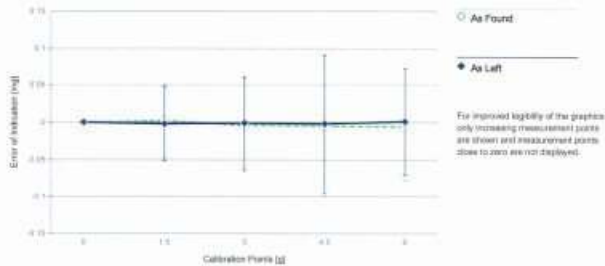
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Error of Indication

Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1* 0.00000 g	0.00000 g	-0.00000 g	0.0054 mg	2
2 0.01004 g	0.01000 g	-0.00004 g	0.0074 mg	2
3* 0.05005 g	0.05000 g	-0.00005 g	0.011 mg	2
4* 0.10007 g	0.10000 g	-0.00007 g	0.015 mg	2
5 0.15012 g	0.15011 g	-0.00001 g	0.025 mg	2
6 0.170013 g	0.17001 g	-0.00003 g	0.034 mg	2
7* 0.20011 g	0.20009 g	-0.00002 g	0.018 mg	2
8 1.500023 g	1.50002 g	-0.00003 g	0.049 mg	2
9 3.800021 g	3.80001 g	-0.00011 g	0.062 mg	2
10 4.500031 g	4.50002 g	-0.00009 g	0.094 mg	2
11 6.000026 g	6.00002 g	-0.00006 g	0.072 mg	2

Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1* 0.00000 g	0.00000 g	0.00000 g	0.0054 mg	2
2 0.01004 g	0.01000 g	-0.00004 g	0.0073 mg	2
3* 0.05005 g	0.05000 g	-0.00005 g	0.011 mg	2
4* 0.10007 g	0.10000 g	-0.00007 g	0.015 mg	2
5 0.15012 g	0.15011 g	-0.00001 g	0.025 mg	2
6 0.170013 g	0.17001 g	-0.00003 g	0.034 mg	2
7* 0.20011 g	0.20010 g	-0.00001 g	0.018 mg	2
8 1.500023 g	1.50002 g	-0.00003 g	0.049 mg	2
9 3.800021 g	3.80002 g	-0.00001 g	0.063 mg	2
10 4.500031 g	4.50002 g	-0.00009 g	0.093 mg	2
11 6.000026 g	6.00002 g	0.00001 g	0.071 mg	2

The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor 'k' - which can be larger than 2 according to EURAMET cp-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

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Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OM, E2

Weight Set No.: W580 Date of Issue: 23-Feb-2022  
Certificate Number: C208581631 Calibration Due Date: 14-Aug-2023

Thermo Hygrometer

Equipment No.: 9H161 Date of Issue: 14-Jun-2021  
Certificate Number: 21H1220 Calibration Due Date: 01-Jun-2022

Remarks

FACT adjustment functionality activated

Value of the built-in weight adjusted

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

Test weight by filler: 0.050005 g ± 0.00004 g, 0.150012 g ± 0.150011 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formulae shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use:  $3 K$

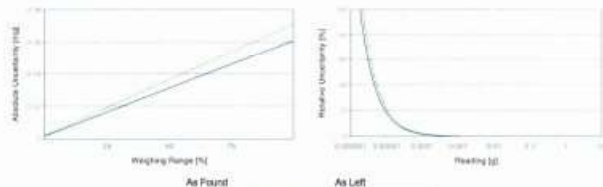
Linearization of Uncertainty Equation

Range	As Found	As Left
d Max		
1 0.00001 g 6.1 g	$U_1 = 0.0021 \text{ mg} + 0.013 \text{ mg/g} \cdot R$	$U_1 = 0.0018 \text{ mg} + 0.0096 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.00010 g	0.0021 mg 0.35%	0.0018 mg 0.30%
0.00100 g	0.0022 mg 0.26%	0.0019 mg 0.20%
0.01000 g	0.0028 mg 0.048%	0.0024 mg 0.039%
0.10000 g	0.0030 mg 0.015%	0.0077 mg 0.013%
0.10000 g	0.071 mg 0.012%	0.061 mg 0.0100%



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บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาชื่นโดย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkokumprhom, Pranakorn, Bangkok 10200  
Tel: 0-2629-0191-6, 0-2280-1787, Fax: 0-2280-1788, E-mail: : thairu@thaiunique.com, Website : www.thaiunique.com

CERTIFICATE OF CALIBRATION  
GAS CHROMATOGRAPH MASS SPECTROMETER

Certificate No.: SV2205/20385

Customer: United Analyst and Engineering Consultant Co., Ltd.

Address: 3 Soi Udomsuk 41 Sukhumvit Rd. Bangchak  
Phrakhanong Bangkok Thailand 10260

Instruments Model: MS Scion-SQ S/N GQS1203F021  
GC 451-GC S/N BR1203M099  
AUTO SAMPLER CP8400 S/N BR1203M331

Standard Reference Number: 393065201  
Procedure Document Number: 394207000

System Test

PM perform and Diagnostic Test	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
Air Water Check Test	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
Tune Test EI	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
Signal to Noise Test (EI) SCAN	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
Injection EI Area Precision Test	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
Injection EI RT Precision Test	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
User Demonstration	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

Engineer: Somchai P.  
Somchai Pohtongkam

Date: 19 May 2022

เอกสารไม่ควบคุม



## Contact

Scion Customer Service and Support uses a Customer Relationship Management (CRM) system. The interaction with this system offers the Customer immediate benefits including the contact center or help desk.

Scion worldwide service & support offices can be found from Scion website:



[www.scion.com/support.html](http://www.scion.com/support.html)

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## 2.0 Qualification Representative and Reviewer Details

### 2.1 Qualification Representative Details

Each person responsible for executing any part of this Protocol must complete the table below, providing a sample of their signature and initials, and recording the date the Qualification was performed.

Qualification representatives are nominated to execute and verify the completeness of the test protocol and correctness of all entries.

All testing must be performed in accordance with procedures outlined in this manual. The representative must be trained and qualified to perform the procedures outlined in this document.

A copy of their appropriate qualifications is to be inserted into "Qualification Representative Details" on page 30.

Name (Print)	SOMCHAI POHTONGKAM
Title	ENGINEER
Signature	<i>Somchai P.</i>
Initials	SOMCHAI
Date	19 MAY 22

Name (Print)	
Title	
Signature	
Initials	
Date	

เอกสารไม่ควบคุม

## 1.0 Revision History

This qualification protocol is updated as necessary, which includes the event of any regulatory changes to Title 21 of the Code of Federal Regulations (21 CFR) Parts 210 and 211 (if applicable), any software or hardware changes, or updates that may impact on regulatory compliance.

Issue Number	Date	Comments

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## 2.2 Reviewer Details

Each representative responsible for reviewing any part of this protocol must record their details in the following tables, providing a sample of their signature and initials, and recording the date the qualification was performed.

An employee or designee of the company operating the instrument must review these qualification procedures. All calculations and data will be checked by the reviewer. Data review must be performed in accordance with the qualification guidelines "Qualification Guidelines and GMP Documentation" on page 10 and in compliance with current Good Manufacturing Practice (cGMP) as specified by 21 CFR Parts 210 and 211.

Documentation supporting training in the area of data review and cGMP must be carefully maintained and reviewed by the instrument owner.

Reviewer representatives are responsible for reviewing the completeness of the qualification protocol and accuracy of all entries.

Name (Print)	CHANA CHANSRI
Title	ENGINEER
Signature	<i>Chana Chansri</i>
Initials	
Date	19 MAY 2022

Name (Print)	
Title	
Signature	
Initials	
Date	

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## 2.3 Quality Assurance/Control Details

As Quality Assurance/Control (QA/QC), who is empowered to approve instrument compliance documents, I approve the procedures in the SCION Operational Qualification Protocol, which I may have amended, I accept the qualification of the Qualification Representative, and I will review and initial the results.

Name (Print)	
Title	
Signature	
Initials	
Date	

Name (Print)	
Title	
Signature	
Initials	
Date	

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### 3.0 Customer Responsibilities

The customer shall ensure that the Preventive Maintenance (PM) or Installation Qualification (IQ) up to point 9.11 is completed. A customer representative should be available at all times during the Operational Qualification Protocol.

**Note** The Operational Qualification Protocol test procedure should be performed after significant repairs, and at least once a year.

Qualification Rep. Initials	<i>Sachin P.</i>	Reviewer Initials		QA/QC Initials	
Date	10 MAY 22	Date		Date	

เอกสารไม่ควบคุม

### 4.0 Qualification Guidelines and GMP Documentation

#### 4.1 Qualification Summary

At the end of qualification execution, all tables and data entry fields must be completed and all test results, where specified, must be printed and attached to the protocol.

The Qualification Representative and the Reviewer must sign (signature or initials) and date each page that has a signature field. This represents agreement and acceptance of all data and information on the signed page.

**Note** Scion does not provide instructions for full Qualification of the personal computer (PC) used to operate the SCION. If further qualification of the PC is required the end-user must contact the PC manufacturer.

**Note** Scion does not provide full qualification instructions for non-Scion manufactured accessories. Limited instructions may be supplied. If qualification of a non-Scion accessory is required, the end user must contact the accessory manufacturer.

#### 4.2 Qualification Guidelines

The following are general guidelines for performing the qualification tests in accordance with cGMP for the Manufacturing, Processing, Packaging, or Holding of Drugs per 21CFR Parts 210 and 211. Additional local requirements may also apply.

- Read the guidelines before starting the qualification.
- Perform all tests exactly as written.
- Use a pen with permanent blue or black ink unless otherwise specified by company policy.
- Neatly strike out any incorrect words or numbers, made while writing comments or recording results, information or data within this Protocol, with a single line. The word(s) crossed out must remain legible. Write the correction as close as possible to the original entry. Write a brief description of the error. For example, write 'Transcription error' or 'Re-written for clarity'. Initial and date the change.
- Entering initials where a signature is requested, and vice versa is permitted. The exception to this is in 2.0: Qualification Representative and Reviewer Details on page 6, where examples of each person's signature and initials are required.
- Use the date format dd Mon yyyy (e.g. 08 Mar 2011) unless otherwise specified by company policy.

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- Complete all tables and data fields to comply with this protocol. Blank fields are not permitted. For items that are not applicable, draw a line through the field, and write 'N/A' (Not Applicable). If entire tables or sections of tables are not applicable, strike a line either through the entire table or the specific area and enter 'N/A'. Complete the signature fields on the page.
- Write 'Pass', 'Fail' or 'N/A' as applicable to the test requirement or outcome.
- Ensure that results and/or specific documents are printed and attached to the specified appendix.
- The Qualification Representative and Reviewer must both sign (signature or initials) and date the signature fields on each page. This represents agreement and acceptance of all data and information on the page.

#### 4.3 Page Numbering of Appendices

Each page that is inserted after the appendix is numbered with the letter of the appendix and a sequential number. The appendix page number must be initialed and dated by both the Qualification Representative and the Reviewer.

For example, pages inserted after Appendix C are numbered

C-1, C-2, C-3...etc. along with the initials and date.

If the reverse of each appendix page is left blank, it should be marked 'N/A' and signed and dated.

When the IQ is complete the total number of pages inserted after each appendix is written on the front page of the respective appendix sheet.

Qualification Rep. Initials	<i>Sachin P.</i>	Reviewer Initials		QA/QC Initials	
Date	10 MAY 22	Date		Date	

เอกสารไม่ควบคุม

#### 4.4 Exception Reports

An exception to the protocol occurs when the observed result differs from the acceptance criteria or expected result.

All exceptions to the protocol must be documented in the Exception Report. The Exception Report includes a detailed description of the exception and resolution by the Qualification Representative.

Each Exception Report shall be issued with a unique identification number in the form ERID-XX-X. This number is generated by the page number on which the exception occurred followed by a sequential number indicating each exception found on the page.

For example, if an exception occurs on page 34, the Exception Report shall be identified as 'ERID-34-1'. If another exception occurs on page 34, the second report shall be identified as 'ERID-34-2'. This identification number should be recorded in the 'Pass / Fail / N/A' field after each test.

Each Exception Report must be signed by the Qualification Representative and the Reviewer as evidence of approval.

The Exception Report is inserted in the appropriately named appendix and numbered as per Section 4.3 of this protocol.

Qualification Rep. Initials	<i>Sachin P.</i>	Reviewer Initials		QA/QC Initials	
Date	10 MAY 22	Date		Date	

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#### 4.5 Reference Documents

The following documents are relevant to this Qualification:

- Installation Qualification Protocol
- Completed service report from Preventative Maintenance (PM) schedule

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

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#### 4.6 Required Materials

The following stock solutions are required:

- 100 pg/μL OFN 394204200
- 1 pg/μL OFN 393065201
- 100 pg/μL OFN 393110101
- 10 pg/μL BZP 93065301
- 100 pg/μL BZP 394206200

The above solutions will be used to prepare the following working solutions which will be required to execute this OQ:

**Note** Refer to Appendix 1 for the preparation of the standard solutions.

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

#### 4.7 General Guidelines

The following are general cGMP guidelines.

- Perform each procedure exactly as written.
- Fill in each item on the form or mark it Not Applicable (N/A).
- If an item is marked N/A, initial it and date it.
- The Reviewer reviews and initials all entries recorded by the Qualification Representative.
- Keep all raw data. The Qualification Representative and the Reviewer will initial it, and date it.
- Do not destroy raw data.
- Attach raw data from an instrument, such as the SCION, as an Addendum using the instructions in the following Addendums section.
- If several instruments are qualified simultaneously, reference shared information, such as standard preparation and chemical information, to the document containing the original information by its model and instrument identification number.
- Label all reference standards as required by local regulations.
- Record the time each reference standard was opened.
- Use reference standards within 24 hours of preparation.

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

#### 4.8 Specific Instructions for Documentation

The Reviewer designates specific documentation instructions as follows:

Permanent Ink Color	Blue
Preferred Date Format	19 MAY 22

If more instructions are required, Use an addendum sheet, write the addendum number, and a brief description.

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

#### 4.9 Documentation Corrections

**Note** All original entries must remain legible after corrections are made.

1. Draw a line through the incorrect information.
2. Write the correction as close as possible to the original entry, or enter a footnote.
3. Write a brief description of the error. For example, write "transcription error," "rewritten for clarity," or "correcting wrong entry".
4. Initial and date the change.

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

#### 4.10 Marking Procedures Not Applicable

Some sections may not be relevant for the qualification. To indicate that a procedure or part of a form is unnecessary and that it was not forgotten or inadvertently overlooked:

1. Draw a line through the portion that is not applicable. Write the letters N/A (for not applicable), your initials, and the date near the diagonal line.
2. If a procedural step is unnecessary, select N/A if it is indicated, or write a comment in an Addendum. The Qualification Representative and the Reviewer enter their initials and the date near the line.

**Note** The Qualification Representative and Reviewer must sign and date all forms, even when part or all of the form is marked N/A.

Qualification Rep. Initials	Sachin P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

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#### 4.11 Addendums

The following are reasons to complete an addendum sheet:

- A deviation needs documentation.
- Additional information or data needs to be recorded.
- Insufficient space to include the correction on the sheet where the error was made.

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

#### 4.12 Addendum Example

The following is an example of using an addendum sheet to document a deviation.

If some of the items on the sales order were not present, you could do the following:

1. Use an addendum sheet.
2. Write Instrument Delivery on the Procedure line.
3. Write the addendum page number followed by a letter. For example: page 12A, where 12 is the page and A represents the first addendum on that page.
4. Write the plan to obtain the missing items, which may be the following:
  - Scion notified that Part Number XXXXX and XXXX are missing.
  - Scion replied that the parts are in stock and will be sent overnight. While waiting for the parts to arrive, I will continue to set up the instrument.
5. Review the plan with the Reviewer and make the necessary modifications.
6. Document the arrival of the parts and write that this addendum is resolved. Attach a copy of delivery documents and create addendum pages as required.

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

## 5.0 Operational Qualification

This chapter contains the tests to be completed to perform an Operational Qualification for the SCION.

### 5.1 OQ Preparation

The following must be done before starting the OQ:

1. Preventative Maintenance must have been completed and signed off by the Qualification Representative, Reviewer, and QA/QC person, and attach a copy of the service report and add an addendum number.

Addendum P.M. Protocol

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

2. OQ must have been completed and signed off by the Qualification Representative, Reviewer, and QA/QC person.

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

3. The QA/QC person must review, approve, append (if necessary), and sign the Pre-execution Approval.

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

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4. The Qualification Representative and the Reviewer must sign and date the Pre-execution Approval.

Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

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## 5.2 System Description

### 5.2.1 SCION Description

Installation Date:	2015	Principal Operator:		Phone Number:	
<b>Company Information</b>					
Company: United Analyst and Engineering			Installation Site: LAB		
Name:			Building:		
Address: 3 Soi Udornkai			Address/Location: Sukhumvit Rd.		
City, State: Bangkok, Bangkok			City, State: Bangkok		
Zip/Country: Thailand			Zip/Country: 10260		
<b>System Description</b>					
SCION:	SQR	Serial Number:	GAS 1203F021		
Sales Order Number:		Sales Order Addendum Number:			
GC					
Module Type:	Scion 151	Serial Number:	BR1203M099		
<b>AutoSampler</b>					
Module Type:	CP 8400	Serial Number:	BR1203M331		
<b>MS Workstation</b>					
Version:	MSWS 8.2.1	Serial Number:	01106-6711-BBQ-450C		
<b>Computer Operating System</b>					
Operating System:	Windows 7	Version:	Pro	Serial No.:	00366150-436-155 Pack: -
<b>Computer</b>					
Make:	Dell	Model:	Optiplex	Serial No.:	DNYH5I
		Hard Drive:	1TB	Size / RAM:	16GB
Addendum Number(s):	2- System description				
Qualification Rep. Initials	Sanchai P.	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

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### 5.3 Data Sheet Specifications

Run these tests after the instrument has pumped down and is leak free. Use the factory methods. Follow the Installation Procedure; complete this section and the appropriate line of the OQ Summary. Print out the methods and results and attach as addendums. Use the factory test column Br-5ms 15m X 250um X 0.25um.

Table 5-1 TQ Specification

Mode	Concentration	Scan Range	Result †	N/A	Pass	Fail	Addendum
EI Full Scan	1 pg OFN	50-300	S/N ≥500:1				
EI MRM	100 fg OFN	272-222	S/N ≥5000:1				
PCI Full Scan‡	10 pg BZP	80-230	S/N ≥50:1				
NCI Full Scan‡	1 pg OFN	200-300	S/N ≥4000:1				

† The Signal-to-Noise ratio S/N values are based on RMS noise figure.

‡ CI tests use methane gas as reagent gas.

For any tests that did not pass, complete an Addendum for each, write the Addendum number and a brief description.

Qualification Rep. Initials	<i>Saukhar P.</i>	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

Table 5-2 SQ Specification

Mode	Concentration	Scan Range	Result †	N/A	Pass	Fail	Addendum
EI Full Scan	1 pg OFN	50-300	S/N ≥600:1		✓		
PCI Full Scan‡	100 pg BZP	80-230	S/N ≥600:1		✓		
NCI Full Scan‡	200 fg OFN	200-300	S/N ≥1000:1		✓		

Qualification Rep. Initials	<i>Saukhar P.</i>	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

### 5.4 EI Precision Test TQ

The following precision tests are for systems with autosamplers only. The test solution is 1 pg/μL OFN test mix part number 393065201.

The following is the required precision for 10 consecutive injections:

Injection	Retention Time	Peak Area
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
% RSD		

As an alternative, a % RSD summary report from MSWS can be added as an addendum.

Addendum	N/A				
Observed Mass is between 271.6 m/z to 272.4 m/z, which is ± 0.4 of the expected m/z.	✓				
Retention Time ≤ 1% Relative Standard Deviation (RSD).	✓				
Peak Area ≤ 10% Relative Standard Deviation (RSD).	✓				

To complete this section use the factory MRM method on the system CD. Print a copy of the method and add as an addendum.

Addendum N/A

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If the hardware is not the same as the factory method, then note this in the addendum and how the hardware available has been configured to compensate. The most common variation here is the sampler, where the Combi Pal has been used instead of the 8400. This will have no impact on results and can be tracked and recorded in the addendum.

### 5.5 EI Precision Test SQ

The following precision tests are for systems with autosamplers only. The test solution is 1 pg/μL OFN test mix part number 393065201.

The following is the required precision for 10 consecutive injections:

Injection	Retention Time	Peak Area
1	3.670	70230
2	3.666	80953
3	3.669	73832
4	3.667	75623
5	3.668	79060
6	3.669	81491
7	3.670	81642
8	3.671	72531
9	3.670	79852
10	3.668	81366
% RSD	0.03	2.16

As an alternative, a % RSD summary report from MSWS can be added as an addendum.

Addendum					
Observed Mass is between 271.6 m/z to 272.4 m/z, which is ± 0.4 of the expected m/z.		✓			
Retention Time ≤ 1% Relative Standard Deviation (RSD).		✓			
Peak Area ≤ 10% Relative Standard Deviation (RSD).		✓			

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To complete this section use the factory Scan method on the system CD. Print a copy of the method and add as an addendum.

Addendum N/A

If the hardware is not the same as the factory method, then note this in the addendum and how the hardware available has been configured to compensate. The most common variation here is the sampler, where the Combi Pal has been used instead of the 8400. This will have no impact on results and can be tracked and recorded in the addendum.

Addendum N/A

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## 5.6 Final Evaluation

	N/A	Pass	Fail	Addendum
Is the equipment in normal operation condition?		<input checked="" type="checkbox"/>		
Have all of the OQ requirements been completed?		<input checked="" type="checkbox"/>		

Qualification Rep. Initials	<i>Sachin P.</i>	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

## 6.0 Protocol Approval

### 6.1 Protocol Acceptance / Approval by Customer

I agree that the procedures and information referenced in this document are applicable.

Instrument(s): *Scion 451 SQ with DP8400*Serial Number(s): *GQS1203F021*

Sales Order Number:

Company Name: *United Analyst and Engineering Consultant Co., Ltd.*

I agree that the Operational Qualification Protocol has been satisfactorily completed.	<input checked="" type="checkbox"/>
I confirm that the Operational Qualification Protocol has not been completed, because of these failed (non-passed) items	<input type="checkbox"/>

### Authorized Customer Representative

Name (Print)	
Title	
Signature	
Initials	
Date	

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## 6.2 Operational Qualification Protocol Assignment

This Operational Qualification Protocol document is used for:

Operational Qualification Protocol as final test at Scion	<input type="checkbox"/>
Operational Qualification Protocol after Installation Qualification	<input type="checkbox"/>
Operational Qualification Protocol after Preventive Maintenance and OQ completion.	<input checked="" type="checkbox"/>

### 6.3 Protocol Acceptance / Protocol Approval by Scion

I agree that the procedures and information referenced in this document are applicable.

Instrument(s): *Scion 451 SQ with DP8400*Serial Number(s): *GQS1203F021*

Sales Order Number:

Company Name: *United analyst and Engineering Consultant Co., Ltd.*

เอกสารไม่ควบคุม

### Scion Certified Engineer

Name (Print)	<i>SOMCHAI POHTONGKAM</i>
Title	<i>ENGINEER</i>
Signature	<i>Sachin P.</i>
Initials	<i>SOMCHAI</i>
Date	

### 6.4 Remarks

เอกสารไม่ควบคุม

## Appendices

Each page that is inserted after the appendix is numbered with the letter of the appendix and a sequential number. The appendix page number must be initialed and dated by both the Qualification Representative and the Reviewer.

For example, pages inserted after Appendix C are numbered C-1, C-2, C-3... etc along with the initials and date.

If the reverse of each appendix page is left blank it should be marked NA and signed and dated.

When the OQ is complete the total number of pages inserted after each appendix is written on the front page of the respective appendix sheet.

เอกสารไม่ควบคุม

### A.1 Qualification Representative Details

The Qualification Representative is to insert a copy of their appropriate qualification(s) after this page.

No. of Pages Inserted	
-----------------------	--

*This area is intentionally left blank.*

เอกสารไม่ควบคุม



## Certificate

It is hereby certified that

**Mr. Somchai Pohtongkam**

Has successfully completed the Service & Application Training for

**Scion Chromatography Products**

Training Contents were:

Hardware Operation, Software operation, Data analysis and Installation, & Troubleshooting of Model:

**SCION GC, GCMS SQ, GCMS TQ**

At Techcomp Singapore  
By Mr. Michael Mei (Service Manager)

On 11<sup>th</sup>-15<sup>th</sup> July 2016

Hans van den Heuvel  
Commercial Director  
Scion Instruments

Date: 19 July 2016

Cert. No.: TSG-SCIONGC-15011602

เอกสารไม่ควบคุม

### B.1 Exceptions

Each Exception Report shall be issued with a unique identification number in the form of ERID-XX-X. This number is generated by the page number on which the exception occurred followed by a sequential number indicating each exception found on the page.

For example, if an exception occurs on page 34, it shall be identified as Exception Report 'ERID-34-1'. If another exception occurs on page 34, the second exception shall be identified as 'ERID-34-2'. This identification number should be recorded in the pass/fail field after each test.

Insert Exception Reports (if any) after this page.

No. of Pages Inserted	N/A
-----------------------	-----

*This area is intentionally left blank.*

เอกสารไม่ควบคุม

Addendum Procedure: P.M. Protocol Page Number: 9

Qualification Rep. Initials	<u>Sorap P.</u>	Reviewer Initials		QA/QC Initials	
Date	<u>19 MAY 22</u>	Date		Date	

เอกสารไม่ควบคุม



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาวิทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพมหานคร 10200

80-82 Prachathipatjai Rd., Bangkokphruen, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-5, 0-2280-1787, Fax. 0-2380-1788, E-mail : thowatt@thaiunique.com, Website : www.thaiunique.com

## PREVENTIVE MAINTENANCE PROTOCOL

## FOR GAS CHROMATOGRAPH MASS SPECTROMETER

Model & Serial Number: 5A S/N 3A31203F021Customer: United Analyst and Engineering Consultant Co., Ltd.Date: 19 MAY 2022

## GC System

- ☒ Clean all system
- ☒ Check circuit board connector and cable
- ☒ Check column oven heater feed - through, fan motor, motor and bearings
- ☒ Check all LED's and readout display
- ☒ Check operation of all heated zones
- ☒ Check flow rates, filters and gases
- ☒ Verify flow controller operation

## MS System

- ☒ Check fan motor MS
- ☒ Check circuit board connector and cable
- ☒ Run electronic Diagnostics
- ☒ Check Gas Clean Filter
- ☒ Check for leak system
- ☒ Check turbo pump ( system status )
- ☒ Check vacuum oil
- ☒ Check temperature zone
- ☒ Check air/water ( max 18-19, 28 )
- ☒ Check HMN
- ☒ Clean Trap ( Saturn,MS200, 4000 Series ) or Ion source ( 120BL, 300, SQ,TQ Series )
- ☒ Check Electron multiplier ( If close to 2,000 Volts, Change the multiplier )
- ☒ Check Cal Gas ( FC-43 )
- ☒ Sensitivity ( EI Scan Mode S/N Ratio with file OFN )
- ☒ Check %RSD of Area (EI Scan Mode, for OFN )
- ☒ Check %RSD of RT (EI Scan Mode, for OFN )

SIGN :

Engineer : Sorap P.  
Sorap P. PetchakarnCustomer : \_\_\_\_\_  
\_\_\_\_\_

เอกสารไม่ควบคุม

## Version information

About 451-GC

Details

Software Version: 5.09

Hostname: GC\_123 (IP 10.190.85.10)

Mac Address: 00:e0:4b:34:f5:0d

Software Version: 4.05

GC\_Application: 27267

LUI\_Application: 0

Ok

## Version information

About 451-GC

Details

Injector EFCs:

Software Version

Front: 1.35

Middle: 1.35

Rear: 0.0

Serial number

Front: 26254

Middle: 26256

Rear: -1

Ok

## Version information

About 451-GC

Details

Hardware

Mainboard: 14

Mainboard SerialNr: 200048

Option Board: 0

Option Board SerialNr: 0

Firmware

I/O Controller: 2.2

I/O Extender: 1.3

Option Board Controller: 0.0

Ok

## Version information

About 451-GC

Details

Detector EFCs:

Software Version

Front: 0.0

Middle: 0.0

Rear: 0.0

Serial number

Front: -1

Middle: -1

Rear: -1

Ok

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม





The screenshot shows a dialog box titled "Version information" with a blue header bar. It has two tabs: "About 451-GC" (selected) and "Details". The "About 451-GC" tab displays the following information:

- Autosampler:
- CP84xxMBus: 2.0
- CP84xxTS1: 1.0
- CP84xxTS6: 1.20
- CP84xxTray: 1.20
- CP84xxTower: 1.20
- CP84xxSyringe: 1.21
- CP84xxPlunger: 1.20

Below this list, it says "GC Application build info:". At the bottom right, there is an "Ok" button.

**Version Information**

About 451-GC      Details

CP84xTray: 1.20  
 CP84xTower: 1.20  
 CP84xSyringe: 1.21  
 CP84xPlunger: 1.20

GC Application build info:  
 User: autobuilder  
 IP address: 10.190.65.195  
 Mac address: 00:26:b9:86:6a:c4  
 Timestamp: 19-09-2011 18:25

Ok

```

451-CC Setup
Column 1 (min Zone): Temp Limit 265.0 C, No Coolant
Zone 1: Front S/S/L - Temp Limit 260.0 C, No Coolant
Zone 2: Mid PTV - Temp Limit 325.0 C, NO Coolant
Zone 3: N/A Configured
Zone 4: Not Configured
Zone 5: Not Configured
Zone 6: N/A Configured
Zone 7: N/A Configured
Valve 01 is Unused
Valve 02 is Unused
Valve 03 is Unused
Valve 04 is Unused
Valve 05 is Unused
Valve 06 is Unused
Valve 07 is Unused
Valves 08-15 not installed; require option board

Front S/S/L Injector is associated with zone 1
Mid PTV Injector is associated with zone 2
Front Injector ETC Type 21 Outlet: Vacuum, Under psi, SpillRate Venti: 20 ml/min; Gas Server: 20 ml/min after 0.00 min, Backflush Disabled
Mid Injector ETC Type 21 Outlet: Airs, Under psi, SpillRate Venti: 20 ml/min; Gas Server: 20 ml/min after 0.00 min, Backflush Disabled

Front Column (Type WCOT) is Configured with L=3000 cm, D=250 microns, He Carrier Gas
DB624
Mid Column (Type WCOT) is Configured with L=3000 cm, D=250 microns, He Carrier Gas
BP Gas
Rear Column not Configured

8400 Autosampler connected to SID-2 is Configured with 10 of Syringe In Ports in Both Positions
Nothing connected to SID-1

```

## เอกสารไม่ควบคุม

MSWS 8.2.1 for IQ MS

BRUKER

BRUKER Daltonics  
MS Workstation

System Control Version 8.2.1

Copyright © 2016, Bruker Service Code: MSWS-01106

Enabled Module Drivers

- Bruker GC MS
- 430 GC
- 430 GC
- Bruker CTC P&L

Installation History

MS Workstation

S/N: 01106-6711-680-450C  
Installed by: Bruker  
Organization: Microsoft  
Installation date: 14/8/2563 9:27

Validate Installed Files Close

## เอกสารไม่ควบคุม

SCION Operational Qualification Protocol

Addendum Procedure: 2. System description Page Number: 5

Qualification Rep. Initials	<i>Sambor P.</i>	Reviewer Initials		QA/QC Initials	
Date	19 MAY 98	Date		Date	

## เอกสารไม่ควบคุม

Addendum Procedure: 3. Test Result Page Number: 30

Qualification Rep. Initials	<i>Snobun P.</i>	Reviewer Initials		QA/QC Initials	
Date	19 May 22	Date		Date	

เอกสารไม่ควบคุม

## SCION PG system hardware test

Test date 5-18-2022

## Main module test

Passed -> Power supply test  
Passed -> Main user analog out test

## CIDV module test

5-18-2022

vent valve can only be tested when vented  
pressure sensor and pneumatics not tested in single quad system  
Passed -> CIDV module test

## env module test

5-18-2022

Passed -&gt; env module test

CIS Tests only performed on a CI system

## EI module test

5-18-2022

Passed -> EI High voltage OC rail test  
Passed -> EI Lens 1 test  
Passed -> Lens 2 test  
Passed -> Repeller test  
Passed -> Electron energy test  
Passed -> EI Source test

CI Tests only performed on a CI system

## Det module test

5-18-2022

## Detector module test

Passed -> Power supply test  
Passed -> HV Power supply type test  
Passed -> HV Power supply Revision test  
Passed -> Detector accelerator test  
Passed -> Detector baseline dac test  
Passed -> Detector Noise test  
Passed -> Detector multiplier dac test  
Passed -> Detector module test

## Q0 module test

5-18-2022

Passed -&gt; Q0 module test

## Q1 module test

5-18-2022

## Main module test

5-18-2022

Passed -> LED test  
Passed -> Speaker Test  
Passed -> Power supply test  
Passed -> Main user analog out test  
Passed -> Main module test

Passed -&gt; Q1 module test

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

```
CIDV module test
-----
5-18-2022

Passed -> CIDV Power supply test
Passed -> Turbo control test
vent valve can only be tested when vented
pressure sensor and pneumatics not tested in single quad system

Passed -> cidv module test
```

เอกสารไม่ควบคุม

```
env module test
-----
5-18-2022

Passed -> Power supply test
Passed -> temp sensor test
Passed -> Valve current test
Passed -> env fan test
Passed -> heater current test

Passed -> env module test
```

เอกสารไม่ควบคุม

```
EI module test
-----
5-18-2022

Passed -> EI Power supply test
Passed -> EI High voltage DC rail test
Passed -> EI Lens 1 test
Passed -> Lens 2 test
Passed -> Repeller test
Passed -> Electron energy test
Passed -> AMP test
Passed -> EI Filament test
Check maximum heater current and heater wattage
Max Heater Current = 1.27 Wattage = 39.46
Source heater wattage measures OK
Passed -> EI Heater test
Passed -> EI Source test
```

เอกสารไม่ควบคุม

```
Det module test
-----
5-18-2022

Passed -> Power supply test
Passed -> HV Power supply Type test
Passed -> HV Power supply Revision test
Passed -> Detector accelerator test
Passed -> Detector baseline dnc test
Passed -> Detector Noise test
Passed -> Detector multiplier dac test
Passed -> Detector module test
```

เอกสารไม่ควบคุม



# QE module test

5-18-2022

Passed -> Power supply test  
Passed -> QE High voltage DC rail test  
Passed -> QE DAC test  
Passed -> Quad offset test  
Passed -> RF detector test  
Passed -> RF modulator test  
Passed -> RF current test  
Passed -> Heater current test  
Passed -> QE module test

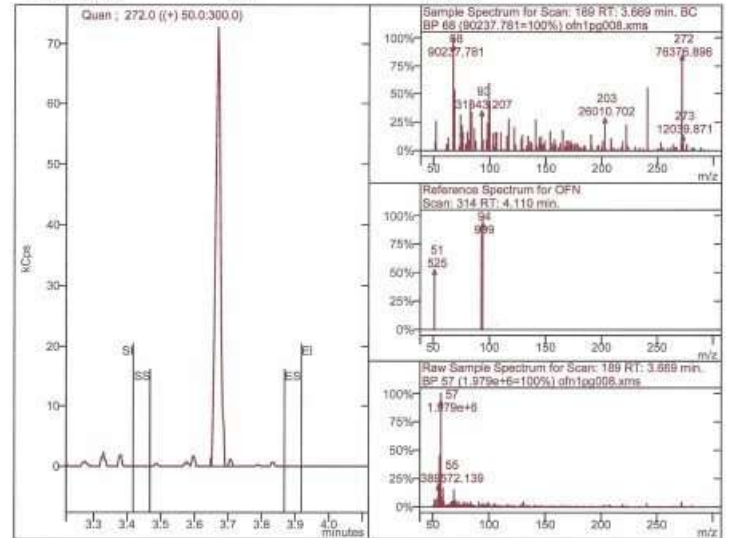
เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:08:30

Target Compound report for #1 from dm1pg008.xmls

Sample ID:	dm1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	18/5/2565 12:23	Data File:	...022ioddm1pg008.xmls
Calculation Date:	18/5/2565 12:28	Method:	...dsipm2017/ls_plv.mh
Sample Type:	Analysis		
Inj. Sample Notes:	None		

Compound Information			
Peak Name:	OFN	Compound Number: 1	CAS Number: None
Result Index:	1		Identified
Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.670 min.	Pass
Match Result		N/A	
Integration and Quantitation			
Parameter	Specification	Actual	Status
Quan Ions	272.0		
Calibration Equation	Average		
Area	>=10	74230	Pass
Height		72761	
Amount (Conc.)	>= 0	74 Counts	Pass



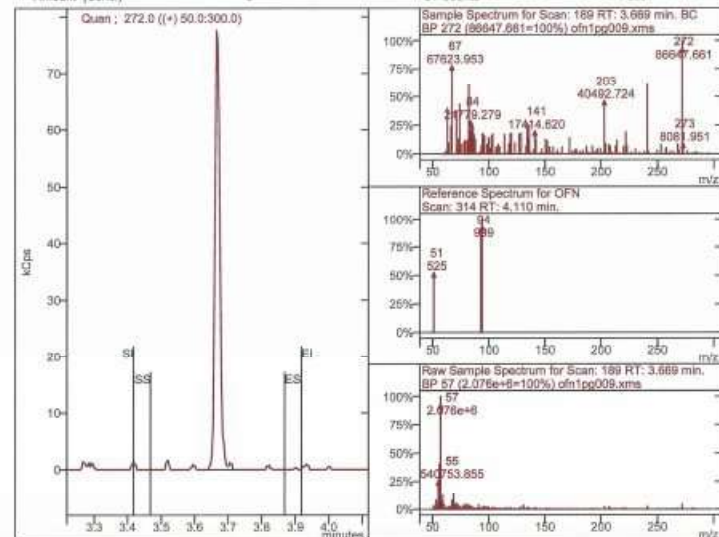
เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:08:39

Target Compound report for #1 from dm1pg009.xmls

Sample ID:	dm1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	18/5/2565 12:36	Data File:	...022ioddm1pg009.xmls
Calculation Date:	18/5/2565 12:41	Method:	...dsipm2017/ls_plv.mh
Sample Type:	Analysis		
Inj. Sample Notes:	None		

Compound Information			
Peak Name:	OFN	Compound Number: 1	CAS Number: None
Result Index:	1		Identified
Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.669 min.	Pass
Match Result		N/A	
Integration and Quantitation			
Parameter	Specification	Actual	Status
Quan Ions	272.0		
Calibration Equation	Average		
Area	>=10	80663	Pass
Height		76589	
Amount (Conc.)	>= 0	81 Counts	Pass



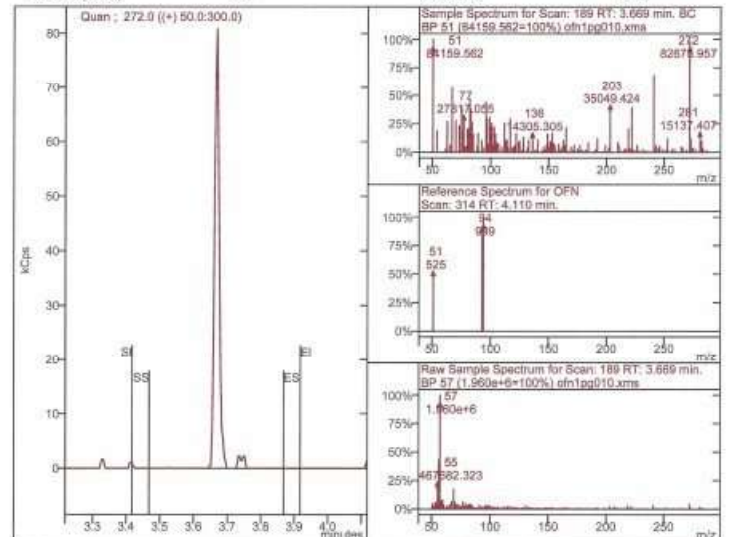
เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:09:21

Target Compound report for #1 from dm1pg010.xmls

Sample ID:	dm1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	18/5/2565 12:49	Data File:	...022ioddm1pg010.xmls
Calculation Date:	18/5/2565 12:55	Method:	...dsipm2017/ls_plv.mh
Sample Type:	Analysis		
Inj. Sample Notes:	None		

Compound Information			
Peak Name:	OFN	Compound Number: 1	CAS Number: None
Result Index:	1		Identified
Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.669 min.	Pass
Match Result		N/A	
Integration and Quantitation			
Parameter	Specification	Actual	Status
Quan Ions	272.0		
Calibration Equation	Average		
Area	>=10	78832	Pass
Height		80882	
Amount (Conc.)	>= 0	79 Counts	Pass



เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:17:45

Target Compound report for #1 from dm1pg011.xms

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 13:03	Data File:	...022ioq/ofn1pg011.xms
Calculation Date:	19/5/2565 13:08	Method:	...dsipm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

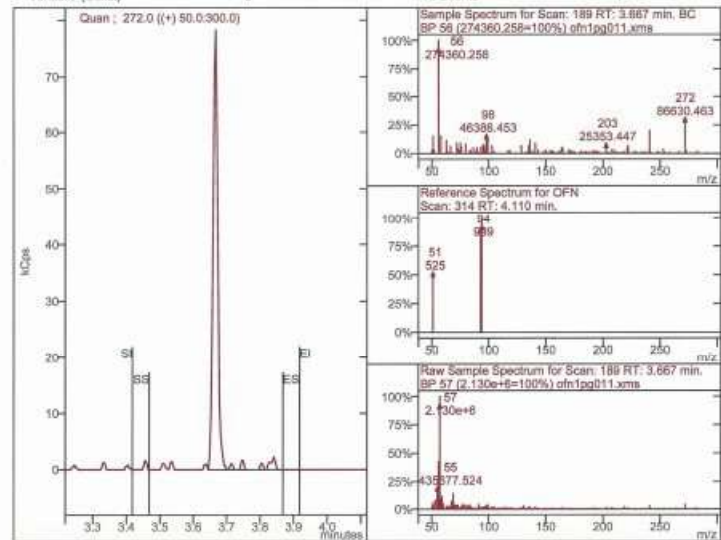
## Compound Information

Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1					
Identification						
Parameter	Specification	Actual	Status			
Search Type	Highest					
Retention Time	3.668 +/- 0.200	3.667 min.	Pass			
Match Result	N/A					

## Integration and Quantitation

Parameter	Specification	Actual	Status			
Quant Ions	272.0					
Calibration Equation	Average					
Area	>=10	75823	Pass			
Height		76279				
Amount (Conc.)	>= 0	76 Counts	Pass			



เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:52:04

Target Compound report for #1 from dm1pg012.xms

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 13:16	Data File:	...022ioq/ofn1pg012.xms
Calculation Date:	19/5/2565 13:21	Method:	...dsipm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

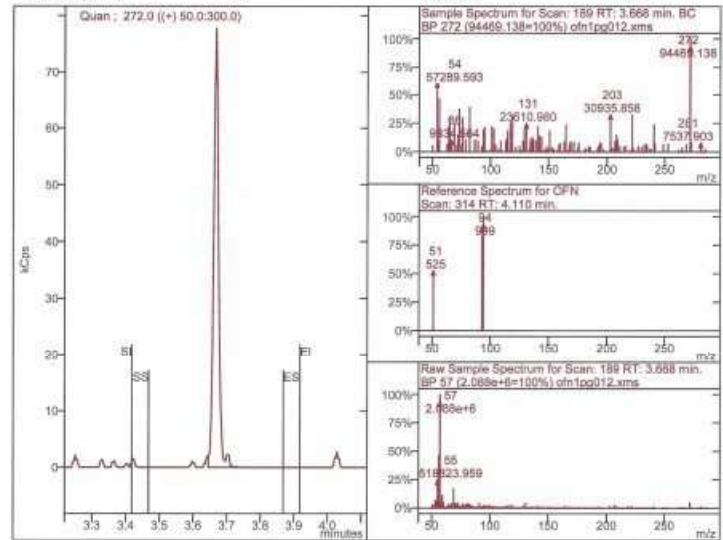
## Compound Information

Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1					
Identification						
Parameter	Specification	Actual	Status			
Search Type	Highest					
Retention Time	3.668 +/- 0.200	3.668 min.	Pass			
Match Result	N/A					

## Integration and Quantitation

Parameter	Specification	Actual	Status			
Quant Ions	272.0					
Calibration Equation	Average					
Area	>=10	79069	Pass			
Height		77781				
Amount (Conc.)	>= 0	79 Counts	Pass			



เอกสารไม่ควบคุม

Print Date: 19 May 2022 13:39:49

Target Compound report for #1 from dm1pg013.xms

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 13:29	Data File:	...022ioq/ofn1pg013.xms
Calculation Date:	19/5/2565 13:34	Method:	...dsipm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

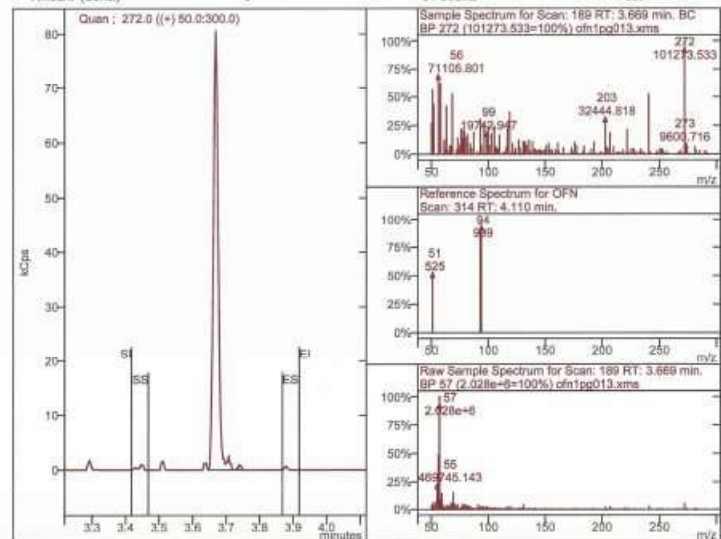
## Compound Information

Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1					
Identification						
Parameter	Specification	Actual	Status			
Search Type	Highest					
Retention Time	3.668 +/- 0.200	3.669 min.	Pass			
Match Result	N/A					

## Integration and Quantitation

Parameter	Specification	Actual	Status			
Quant Ions	272.0					
Calibration Equation	Average					
Area	>=10	81481	Pass			
Height		80643				
Amount (Conc.)	>= 0	81 Counts	Pass			



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:07:07

Target Compound report for #1 from dm1pg014.xms

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Bruker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 13:56	Data File:	...022ioq/ofn1pg014.xms
Calculation Date:	19/5/2565 14:06	Method:	...dsipm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

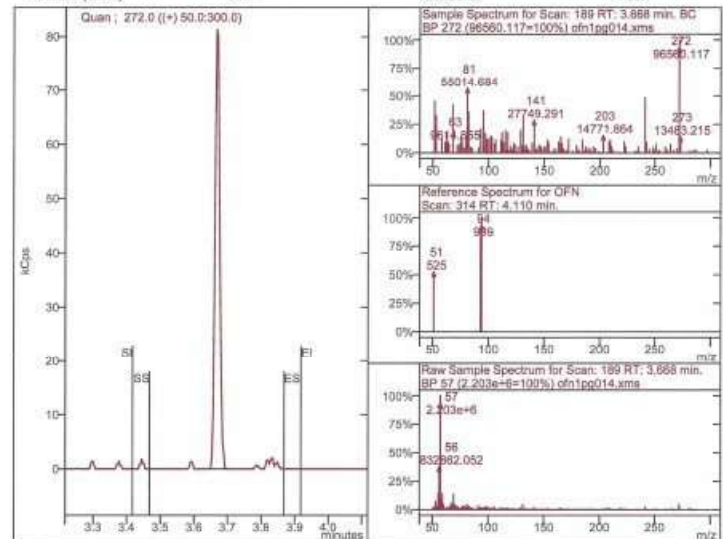
## Compound Information

Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1					
Identification						
Parameter	Specification	Actual	Status			
Search Type	Highest					
Retention Time	3.668 +/- 0.200	3.670 min.	Pass			
Match Result	N/A					

## Integration and Quantitation

Parameter	Specification	Actual	Status			
Quant Ions	272.0					
Calibration Equation	Average					
Area	>=10	81884	Pass			
Height		81381				
Amount (Conc.)	>= 0	82 Counts	Pass			



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:18:08

Target Compound Report for #1 from dm1pg015.xml

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Brüker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 14:09	Data File:	...022\ofn1pg015.xml
Calculation Date:	19/5/2565 14:14	Method:	...ds\pm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

## Compound Information

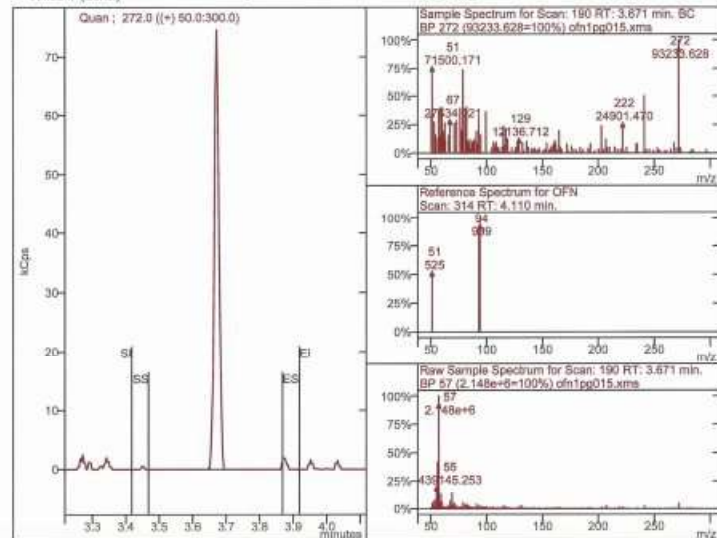
Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1
---------------	---

Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.671 min.	Pass
Match Result		N/A	

## Integration and Quantitation

Parameter	Specification	Actual	Status
Quant Ions	272.0		
Calibration Equation	Average		
Area	>=10	72531	Pass
Height		74597	
Amount (Conc.)	>= 0	73 Counts	Pass



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:33:56

Target Compound Report for #1 from dm1pg016.xml

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Brüker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 14:22	Data File:	...022\ofn1pg016.xml
Calculation Date:	19/5/2565 14:27	Method:	...ds\pm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

## Compound Information

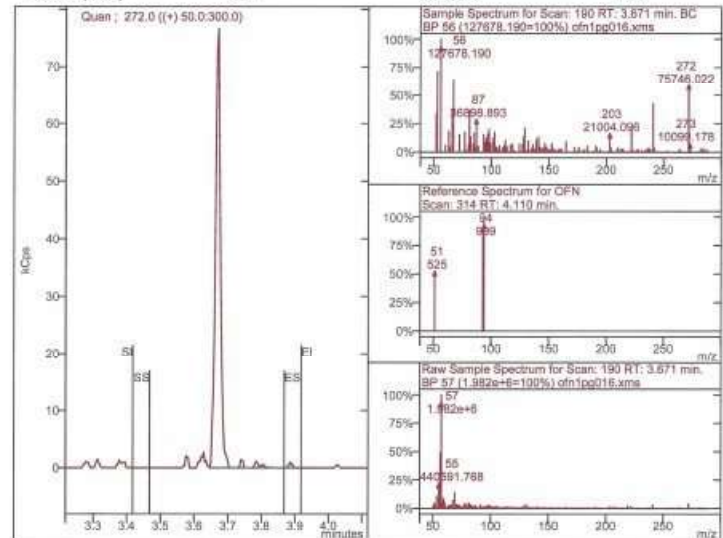
Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1
---------------	---

Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.670 min.	Pass
Match Result		N/A	

## Integration and Quantitation

Parameter	Specification	Actual	Status
Quant Ions	272.0		
Calibration Equation	Average		
Area	>=10	79852	Pass
Height		78645	
Amount (Conc.)	>= 0	80 Counts	Pass



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:49:24

Target Compound Report for #1 from dm1pg017.xml

Sample ID:	ofn1pg	Operator:	TU
Instrument ID:	Brüker GC/MS #1	Last Calibration:	26/11/2557 15:55
Measurement Type:	Area	Calibration Type:	External Standard
Acquisition Date:	19/5/2565 14:37	Data File:	...022\ofn1pg017.xml
Calculation Date:	19/5/2565 14:42	Method:	...ds\pm2017fs_ptv.mth
Sample Type:	Analysis		
Inj. Sample Notes:	None		

## Compound Information

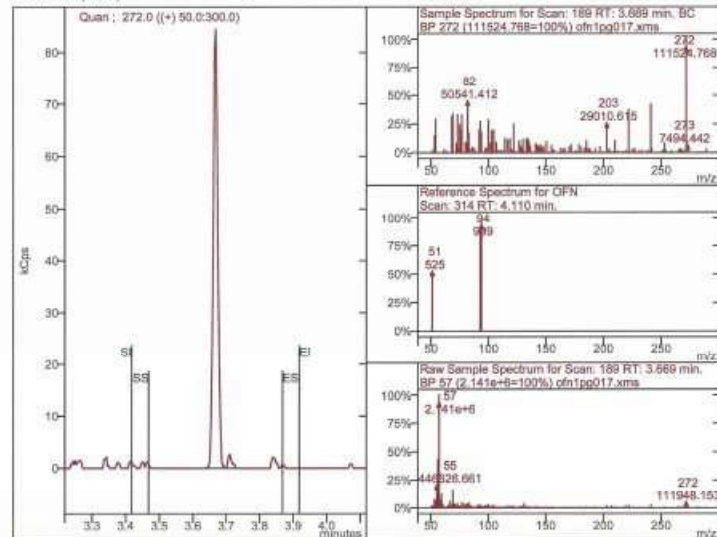
Peak Name:	OFN	Compound Number:	1	CAS Number:	None	Identified
------------	-----	------------------	---	-------------	------	------------

Result Index:	1
---------------	---

Identification			
Parameter	Specification	Actual	Status
Search Type	Highest		
Retention Time	3.668 +/- 0.200	3.669 min.	Pass
Match Result		N/A	

## Integration and Quantitation

Parameter	Specification	Actual	Status
Quant Ions	272.0		
Calibration Equation	Average		
Area	>=10	81366	Pass
Height		84532	
Amount (Conc.)	>= 0	81 Counts	Pass



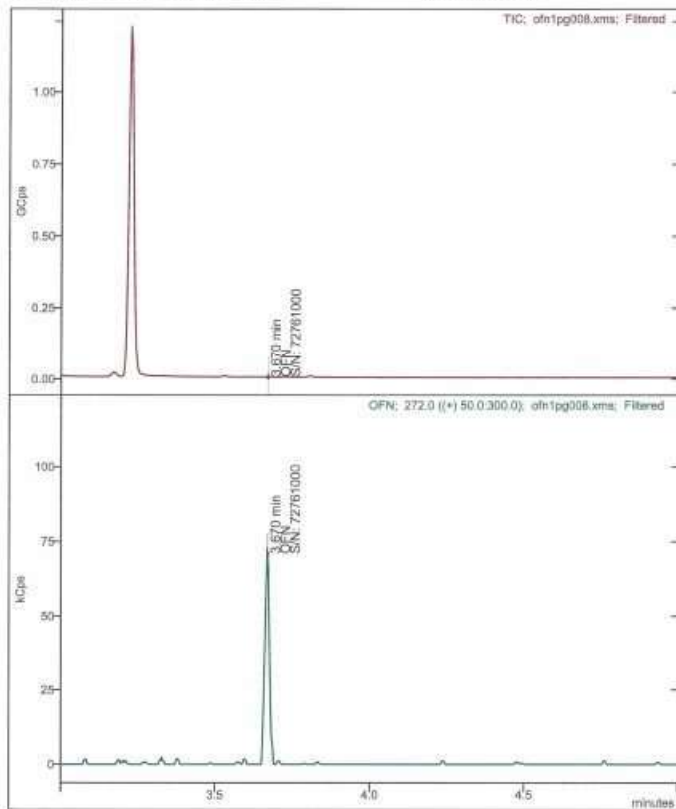
เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:37:33

## Chromatogram Plots

File: e:\tu\pm2022\ofn1pg008.xml  
Sample: ofn1pg  
Scan Range: 1 - 565 Time Range: 3.00 - 5.00 min.

Operator: TU  
Date: 19/5/2565 12:23



เอกสารไม่ควบคุม

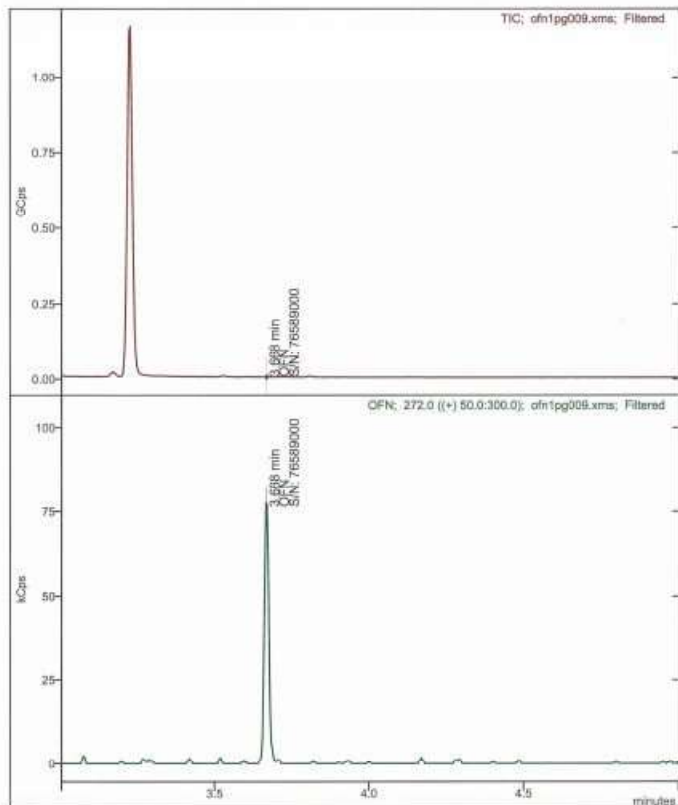


Print Date: 19 May 2022 14:29:55

### Chromatogram Plots

File: e:\tu\pm2022\log\ofn1pg009.xms  
Sample: ofn1pg  
Scan Range: 1 - 564 Time Range: 3.00 - 5.00 min.

Operator: TU  
Date: 19/5/2565 12:36



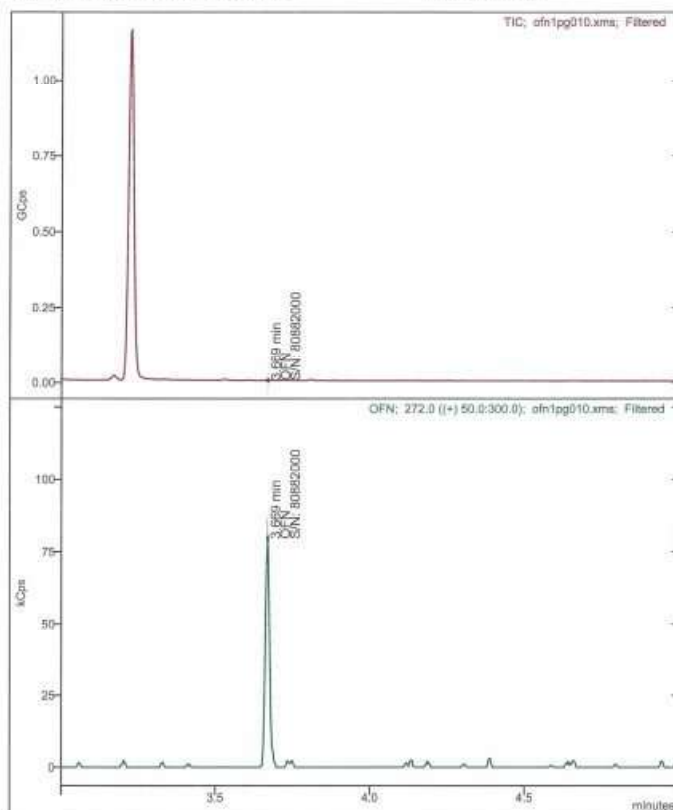
เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:31:34

### Chromatogram Plots

File: e:\tu\pm2022\log\ofn1pg010.xms  
Sample: ofn1pg  
Scan Range: 1 - 565 Time Range: 3.00 - 5.00 min.

Operator: TU  
Date: 19/5/2565 12:49



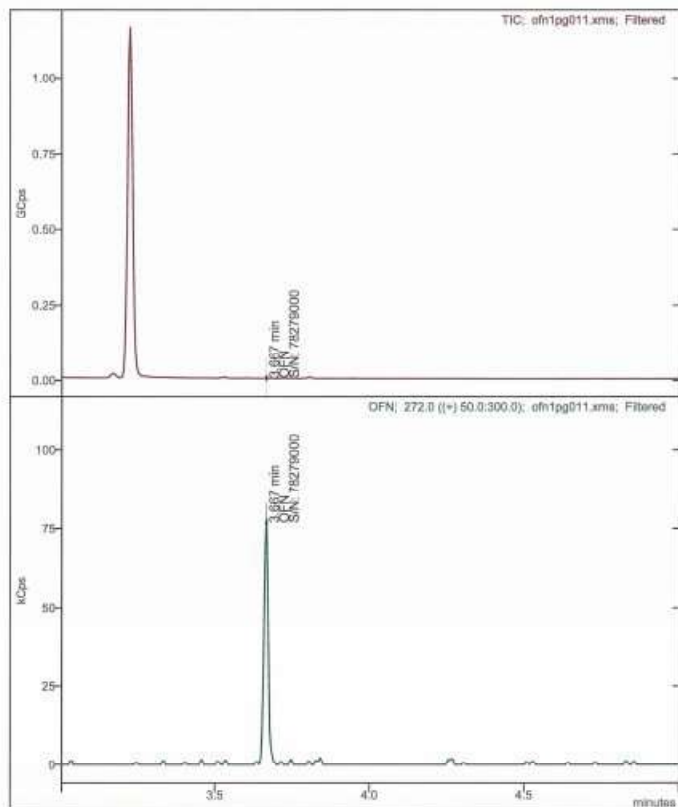
เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:32:00

### Chromatogram Plots

File: e:\tu\pm2022\log\ofn1pg011.xms  
Sample: ofn1pg  
Scan Range: 1 - 566 Time Range: 3.00 - 5.00 min.

Operator: TU  
Date: 19/5/2565 13:03



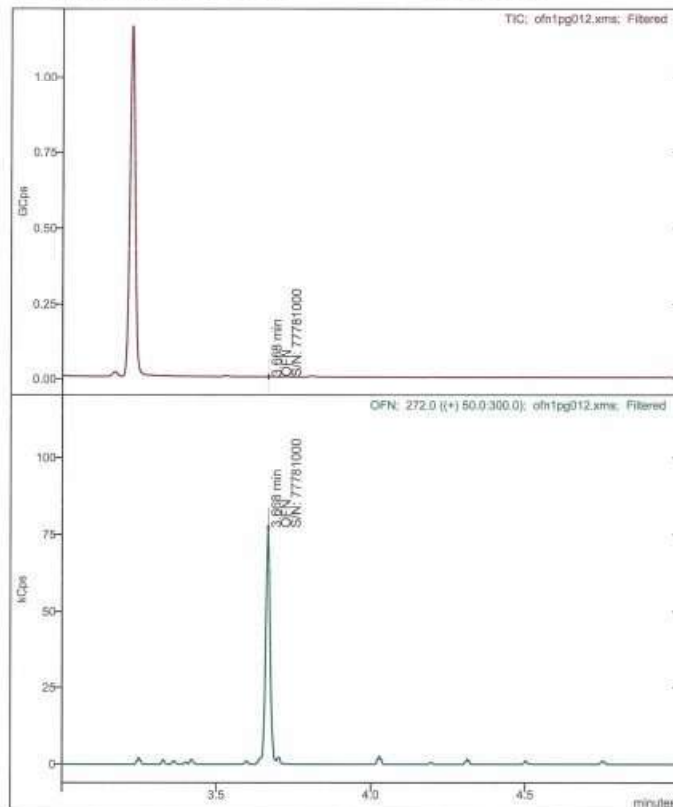
เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:32:23

### Chromatogram Plots

File: e:\tu\pm2022\log\ofn1pg012.xms  
Sample: ofn1pg  
Scan Range: 1 - 566 Time Range: 3.00 - 5.00 min.

Operator: TU  
Date: 19/5/2565 13:16



เอกสารไม่ควบคุม



Print Date: 19 May 2022 14:32:44

### Chromatogram Plots

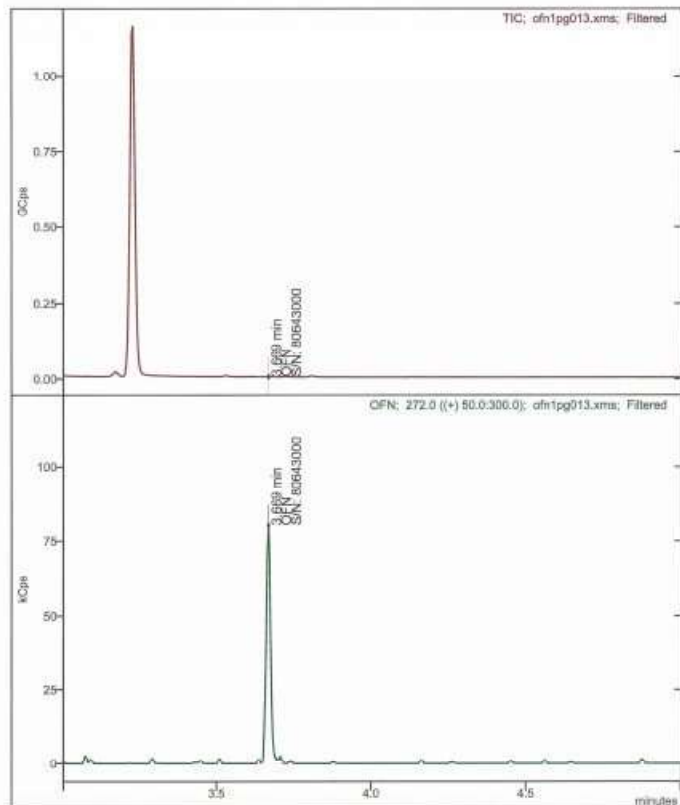
File: e:\u\pm2022\oq\ofn1pg013.xms

Sample: ofn1pg

Scan Range: 1 - 566 Time Range: 3.00 - 5.00 min.

Operator: TU

Date: 19/5/2565 13:29



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:33:09

### Chromatogram Plots

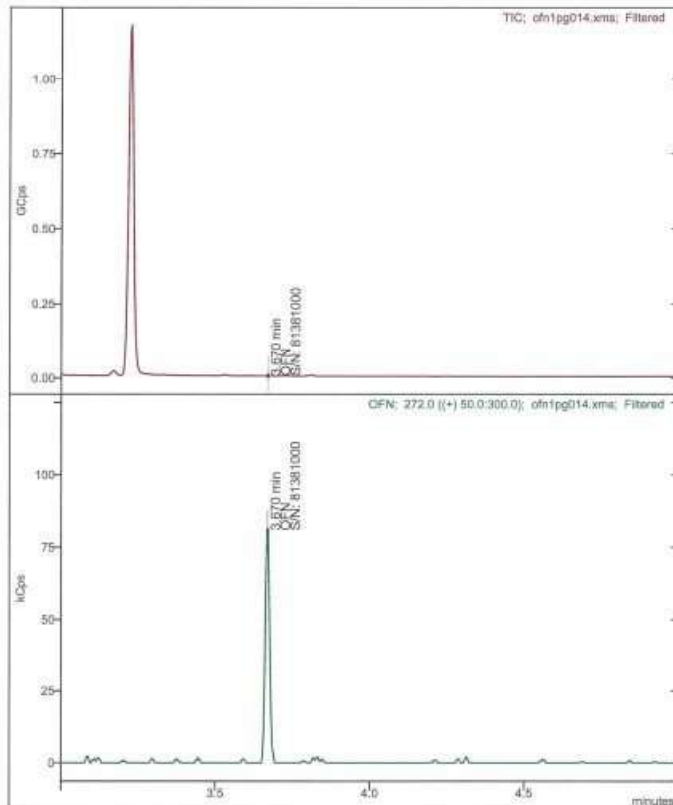
File: e:\u\pm2022\oq\ofn1pg014.xms

Sample: ofn1pg

Scan Range: 1 - 565 Time Range: 3.00 - 5.00 min.

Operator: TU

Date: 19/5/2565 13:56



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:33:38

### Chromatogram Plots

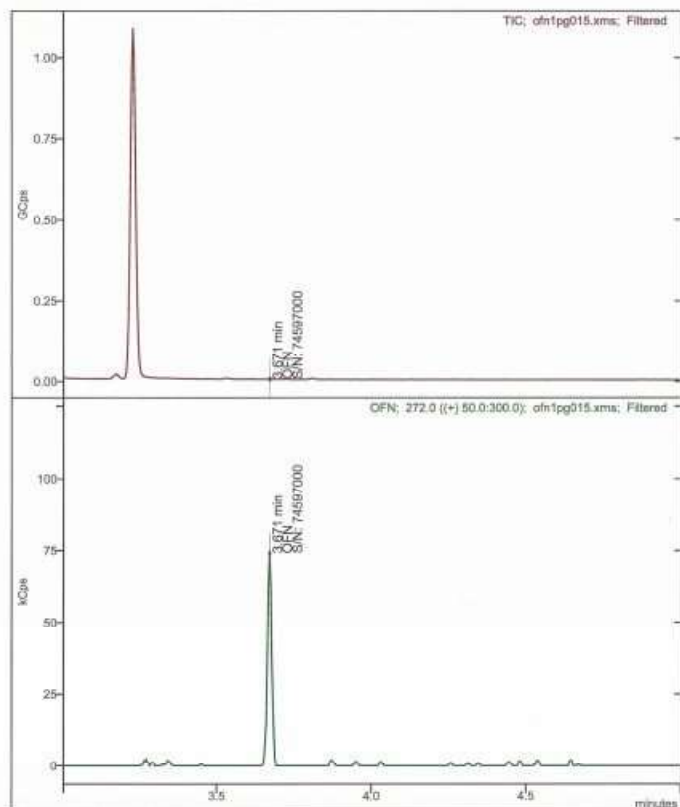
File: e:\u\pm2022\oq\ofn1pg015.xms

Sample: ofn1pg

Scan Range: 1 - 568 Time Range: 3.00 - 5.00 min.

Operator: TU

Date: 19/5/2565 14:09



เอกสารไม่ควบคุม

Print Date: 19 May 2022 14:34:33

### Chromatogram Plots

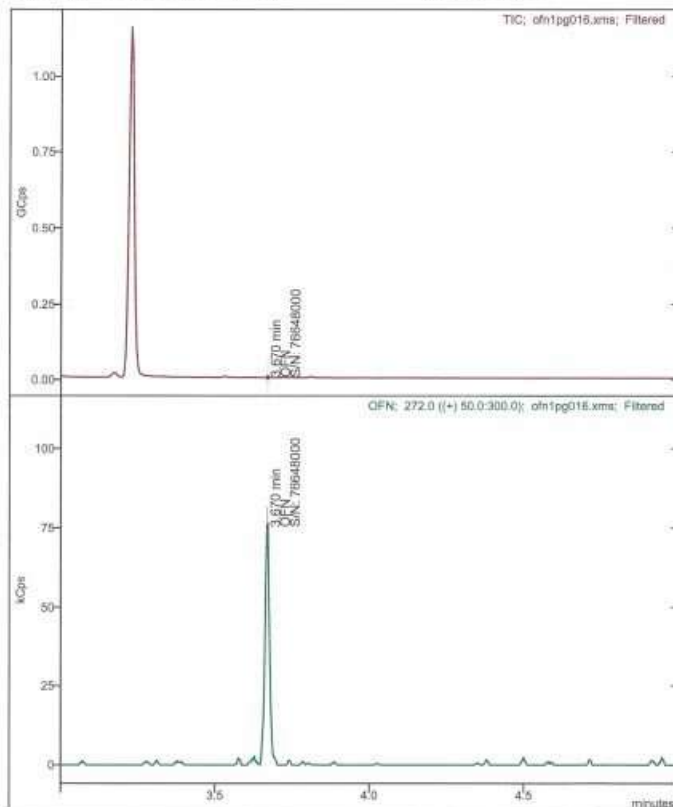
File: e:\u\pm2022\oq\ofn1pg016.xms

Sample: ofn1pg

Scan Range: 1 - 566 Time Range: 3.00 - 5.00 min.

Operator: TU

Date: 19/5/2565 14:22



เอกสารไม่ควบคุม

### Chromatogram Plots

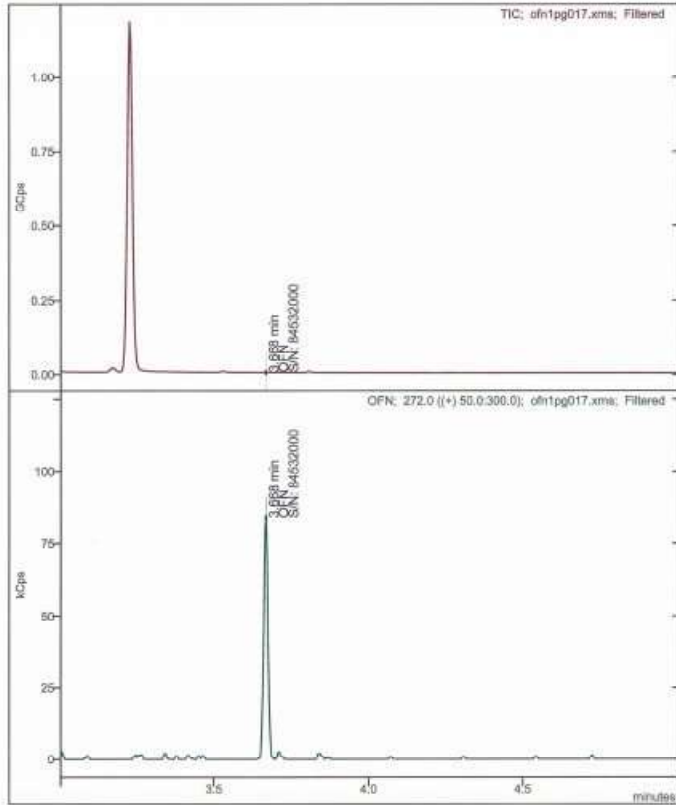
File: a:\tu\pm2022\og\ofn1pg017.xms

Sample: ofn1pg

Scan Range: 1 - 565 Time Range: 3.00 - 5.00 min.

Operator: TU

Date: 19/5/2022 14:37



เอกสารไม่ควบคุม

scan 267853 (15 scans) (Spentaged)

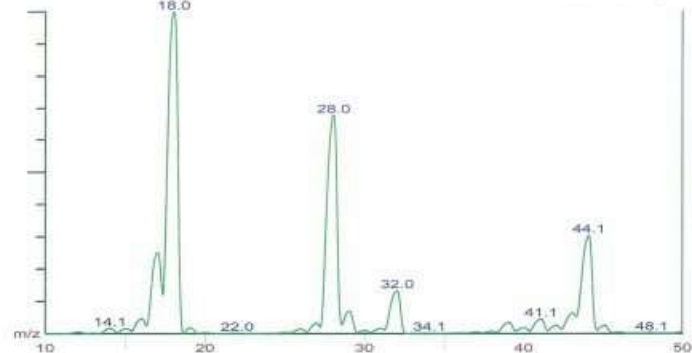
Date: 19 MAY 22 9:17 AM

Notes: EI, EDR On (1)

Compounds: OFN

(+)10-50>

3.08e+007 Cps



28 absolute size (cps)

- Normal < 9.0e7

- Measured 2.12e7

28/32 Ratio

- Normal < 2.8:1 or > 4.2:1

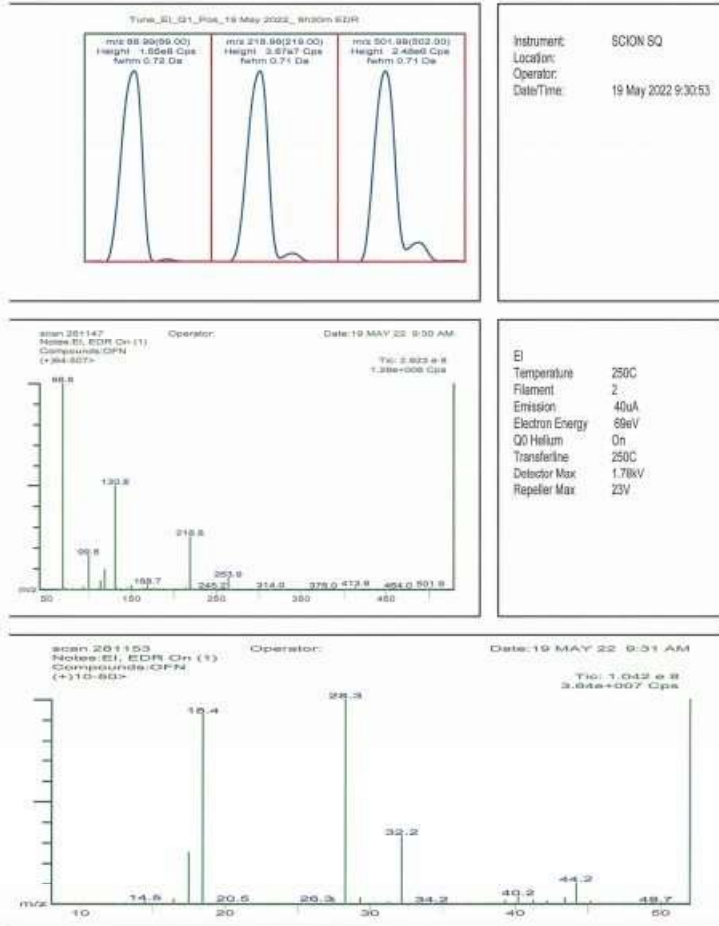
- Measured 5.3:1

28/18 Ratio

- Normal < 2.0:1

- Measured 0.7:1

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม

SCION Operational Qualification Protocol

Addendum Procedure: 1. Certificate Page Number: \_\_\_\_\_

Instrument: SCION SQ  
Location: \_\_\_\_\_  
Operator: \_\_\_\_\_  
Date/Time: 19 May 2022 9:30:53

EI  
Temperature: 250C  
Filament: 2  
Emission: 40uA  
Electron Energy: 69eV  
Q0 Helium: On  
Transferline: 250C  
Detector Max: 1.70kV  
Repeller Max: 23V

Qualification Rep. Initials	<u>Sadun P.</u>	Reviewer Initials		QA/QC Initials	
Date	19 MAY 22	Date		Date	

เอกสารไม่ควบคุม

## Operational Qualification Protocol Certification

for

SCION

with the serial number

GQS1203F21

has successfully completed all criteria for hardware Operational Qualification Protocol  
as detailed in this document.

## Scion Certified Engineer

SOMCHAI ROHTONGKAM *Somchai P.* 10 MAY 22  
Name (please print) Signature Date

## Authorized Customer Representative

Name / Function (please print) Signature Date

## Customer Address

United Analyst and Engineering Consultant Co., Ltd.

เอกสารไม่ควบคุม



## Calibration Certificate

Certificate No.: 2202093-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
ID No.: UAE.WAS.003/2553  
Order No.: 2202093  
Operation No.: 2202093-001  
Date of Receipt: 11 March 2022  
Date of Calibration: 16 March 2022

Calibrated by: Mr. Manas Sornsak Specialist  
Approved by: *Mr. Phengat Tuntit*  
(Mr. Phengat Tuntit)  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement related to the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



## Calibration Report

Certificate No.: 2202093-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
Type: Bench top  
ID No.: UAE.WAS.003/2553

Date of Calibration: 16 March 2022  
Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature : ( 23.0 ± 1.3 ) °C Relative Humidity : ( 45.5 ± 5.0 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration:

1 Calibration Method: In house method : W-CO-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

## 2 Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Exp. Date
2.1 DC Voltage Calibrator	2790007	Fluke	SCL-21F-0667	24 June 2022
2.2 Digital Thermometer	2790007	Fluke	CC-640099-01	30 October 2022
2.3 Thermocouple Meter	802.401974 16598	FOHPE	QR21-2767	16 November 2022

## Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Exp. Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	780012	CPAchem	PH218 LS	21 November 2023
2.5 pH buffer 6.860 (Primary pH buffer Solution)	780019	CPAchem	PH217 LS	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	780015	CPAchem	PH220 LS	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	776840	CPAchem	PH107 LS	8 November 2022

## 3 This calibration is traceable to The International System of Units (SI Unit)

3.1 Instruments No.2.1	Through	NBC-T18-T15 17028 Laboratory Accreditation of Calibration No.0315
3.2 Instruments No.2.2	Through	NBC-T18-T15 17028 Laboratory Accreditation of Calibration No.0351
3.3 Instruments No.2.3	Through	NBC-T18-T15 17028 Laboratory Accreditation of Calibration No.0392
3.4 Certified Reference Material No. 2.4 to 2.6	Traceable to	Primary measurements method: Standard cell using calibrated thermometer, barometer, and manometer. The Standard Solution preparation and certified by CPAchem Ltd. is accredited by ISO 17024 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7	Traceable to	BBM NaH H-7 Lot# 30.04.2020; BBM NaH H-8 Lot# 28.08.2020; BBM NaH H-9 Lot# 29.04.2020; BBM NaH H-10 Lot# 28.08.2020. The Standard Solution preparation and certified by CPAchem Ltd. is accredited by ISO 17024 and ISO/IEC 17025

4. This certificate was certified only for the instrument we calibrated.

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

เอกสารไม่ควบคุม



## Calibration Report

Certificate No.: 2202093-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
Type: Bench top  
ID No.: UAE.WAS.003/2553

Date of Calibration: 16 March 2022  
Calibration Results:  
1. Calibration of pH Meter ( Manual Temperature Compensation at 25 °C )

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
0	414.117	414	0.00	0.58	2.00
2	260.811	260	2.00	0.58	2.00
4	177.482	179	4.00	0.58	2.00
6	59.159	59	6.00	0.58	2.00
7	-0.001	0	7.00	0.58	2.00
8	-59.159	-59	8.00	0.58	2.00
10	-177.483	-177	10.00	0.58	2.00
12	-260.812	-260	12.00	0.58	2.00
14	-414.118	-414	14.00	0.58	2.00

## 2. Calibration of pH Meter with Electrode ( Manual Temperature Compensation at 25 °C )

Equipment: pH Electrode  
Manufacturer: METTLER TOLEDO  
Serial No.: 9432943  
Type: Combined Electrode  
Model: InLab Solis  
ID No. N/A

## Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	172	88.1	0.0071	2.00
6.860	6.87	8	-	0.0074	2.00
10.015	10.01	-475	97.4	0.0090	2.00
6.860	6.86	-3	-	0.0062	2.00

เอกสารไม่ควบคุม

## Calibration Report

Certificate No.: 220203-01-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 120052512 ID No.: UAE-WAS.00302553  
Manufacturer: METTLER TOLEDO  
Date of Calibration: 16 March 2022 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature ( 23.0 ± 1.0 ) °C  
Relative Humidity ( 50 ± 4 ) %

### Condition of this results of Calibration:

- Calibration Method:
  - In house method: W-TS-025 by comparison with standard thermometer.
  - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
  - The temperature scale in use at this laboratory is the International Temperature scale of 1990 ( ITS-90 ).

### 3. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2116154	PSL-7 0851/54	24-Jun-22	T1578
Platinum Resistance Thermometer (PRT)	56274	877552			

Support Equipment: Low Temperature Bath (BIOCAL-6), Model: Europa-6 Plus Basic, SRN: 5410922

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated Item:
  - Good
- Result of Calibration:
  - ☒ Without adjustment
  - ☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

## Calibration Report

Certificate No.: 220203-01-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 120052512 ID No.: UAE-WAS.00302553  
Manufacturer: METTLER TOLEDO  
Date of Calibration: 16 March 2022 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C  
Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model: N/A S/N: N/A
- Dimension of probe: Diameter: 5.5 mm, Length: 135 mm.
- Sheath material: Stainless Steel

UUC Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	15.001	-0.2	0.099
25.2	25.002	-0.2	0.099
35.2	35.002	-0.2	0.099

Note: - UUC: Unit Under Calibration

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

— End —

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
1311 PATTANAKARN ROAD SET 18, BUNGAUANG, SUAN LUNG RANGKOK 10250  
TEL: 0-2171-9490-21 FAX: 0-2171-9498



Cert.No.: 22MM210  
Page.: 1 of 3

## Certificate of Calibration

Equipment: Electronic Balance  
Manufacturer: Mettler Toledo  
Model: XSR205  
Serial No.: C009071872  
ID No.: UAE.WAO.012/2563  
Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phakhanong,  
Bangkok 10260  
Location: Balance Room  
Received order: 26 April 2022  
Calibration Date: 26 April 2022  
Ambient Temperature: 15 °C to 40 °C  
Relative Humidity: 30 % to 80 %  
Calibrated by: Kunchit Promprat  
Approved by:   
( ) Pornthippa Tameyakul  
( ) Maloe Butkrues  
( ) Suwit Imjai  
Issue Date: 29 April 2022

The Uncertainties are for a confidence probability of approximately 95%.

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

เอกสารไม่ควบคุม



Equipment: Electronic Balance  
Condition As-Received: Used Item  
Reference: 2204-0542OC-1

Cert.No.: 22MM210  
Page: 2 of 3

### Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

### Condition of this result of calibration

#### 1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	3 Feb 2023

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certification is traceable to the International System of Unit.

### Result of calibration ( ) Without Adjustment ( \* ) After Adjustment by Internal Calibration

Range capacity:	0 g to 81 g	Resolution 0.00001 g
	81 g to 220 g	Resolution 0.0001 g

### Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (K)
80	80.00004	-0.00004	0.15	2.00
200	199.9999	+0.0001	0.35	2.00

### After Adjustment :

#### 1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
80	0.000008
200	0.000005

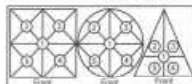
เอกสารไม่ควบคุม





Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : Z204-05420C-1  
Result of calibration

Cert.No.: Z2MM210  
Page: 3 of 3



## 2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.  
The weighing machine reading error obtained is given in the table

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0002	-0.0001	0.0000	-0.0002	-0.0002	0.0002

## 3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.016	2.13
0.05	0.05001	-0.00001	0.016	2.13
0.1	0.10001	-0.00001	0.017	2.11
1	1.00002	-0.00002	0.019	2.05
5	5.00003	-0.00003	0.026	2.00
20	20.00008	-0.00008	0.049	2.00
50	50.00010	-0.00010	0.080	2.00
80	80.00014	-0.00014	0.15	2.00
100	100.0001	-0.0001	0.21	2.00
150	150.0001	-0.0001	0.29	2.00
200	200.0001	-0.0001	0.35	2.00

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 %.

-000-

เอกสารไม่ควบคุม



ศูนย์ทดสอบและบริการวิชาการ  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: Z203527-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomauk 41, Sukhumvit Road,  
Bangchack, Prakhong, Bangkok 10260

Page 1 of 2

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: Seven Compact S220  
Serial No.: C113432421  
ID No.: UAE.WAT.009/2564  
Order No.: Z203527  
Operation No.: Z203527-001  
Date of Receipt: 30 June 2022  
Date of Calibration: 5 July 2022

Calibrated by Mr Worapob Soosong Scientist  
Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
Date of Issue: 5 July 2022

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement listed in the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



ศูนย์ทดสอบและบริการวิชาการ  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: Z203527-001-01  
Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: Seven Compact S220  
Serial No.: C113432421  
ID No.: UAE.WAT.009/2564  
Date of Calibration: 5 July 2022  
Location: Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature: ( 25.5 ± 1.0 ) °C Relative Humidity: ( 55 ± 5 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

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ศูนย์ทดสอบและบริการวิชาการ  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: Z203527-001-01  
Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: Seven Compact S220  
Serial No.: C113432421  
ID No.: UAE.WAT.009/2564  
Date of Calibration: 5 July 2022  
Location: Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature: ( 25.5 ± 1.0 ) °C Relative Humidity: ( 55 ± 5 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

1. Calibration Method In house method : V-CO-052 based on direct measurement by using standard voltage divider and certified reference material (CRM)  
2. Reference Standards : Certified Reference Material

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## Calibration Report

**Certificate No.:** 2203527-001-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C **Model:** Seven Compact 5220  
**Serial No.:** C113432421 **ID No.:** UAE.WAT.009/2564  
**Manufacturer:** METTLER TOLEDO  
**Date of Calibration:** 5 July 2022 Page 4 of 5

**Location:** Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature 25 °C ± 1 °C  
 Relative Humidity 48 % ± 3 %

### Condition of this results of Calibration:

1. Calibration Method : - In house method: W-TE-025 by comparison with standard thermometer.  
 - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
 - The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

### 2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 650057-01	10-Dec-22	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

FCS-012 Revision: 01 Date: 20-04-65

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## Calibration Report

**Certificate No.:** 2203527-001-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C **Model:** Seven Compact 5220  
**Serial No.:** C113432421 **ID No.:** UAE.WAT.009/2564  
**Manufacturer:** METTLER TOLEDO  
**Date of Calibration:** 5 July 2022 Page 5 of 5

**Calibration point:** 15.0, 25.0 and 35.0 °C  
**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : - S/N : -
- Dimension of probe : Diameter 9 mm, Length 120 mm.
- Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.038	- 0.1	0.12
25.1	25.038	- 0.1	0.12
35.2	35.024	- 0.2	0.12

### Note

- UUC\* : Unit Under Calibration

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

----- End -----

FCS-012 Revision: 01 Date: 20-04-65

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
 51/4 PATANASARAK ROAD SOI 11, WUHLIANG, MUANGKONG BANGKOK 10110, THAILAND  
 TEL: 02-2717-3000 FAX: 02-2719-0444



**Cert. No.:** 22TM1490  
**Page :** 1 of 3

## Certificate of Calibration

**Equipment :** Hot Air Oven  
**Manufacturer :** Memmert  
**Model :** UF 55  
**Serial No. :** B216.1686  
**ID No. :** UAE.WAO.027/2559

**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong,  
 Bangkok 10260

**Location :** Lab Floor 2

**Received Order :** 19 October 2022  
**Calibration Date :** 19 October 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hahib

**Approved by :**   
 Approved Signatory

- ( ) Pornthipha Tameysakul  
 ( ) Malee Butkruea  
 (✓) Suwit Imjai

**Issue Date :** 31 October 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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A 0046800



**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2210-05750C-1  
**Procedure Used :**

**Cert. No.:** 22TM1490  
**Page :** 2 of 3

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

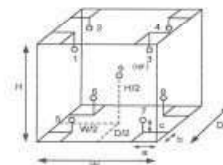
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



**Probe Installation Details :**  
 a = 5.0 cm D = 0.33 m  
 b = 5.0 cm W = 0.40 m  
 c = 5.0 cm H = 0.40 m  
 Capacity = 0.053 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	29	30
REL.Humid. ( % )	47	40
AC Supply ( Volt )	221	220

Ref. Std. ID No. : @ Calibration Point		
Position :	( 104 ) °C	( 140,180 ) °C
1	18-04RTD-01	21-04TC-01
2	18-04RTD-02	21-04TC-02
3	18-04RTD-03	21-04TC-03
4	18-04RTD-04	21-04TC-04
5	18-04RTD-05	21-04TC-05
6	18-04RTD-06	21-04TC-06
7	18-04RTD-07	21-04TC-07
8	18-04RTD-08	21-04TC-08
9 (ref.)	18-04RTD-09	21-04TC-09

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Equipment : Hot Air Oven  
 Condition As-Received : Used Item  
 Reference : 2210-0575DC-1  
 Result of Calibration : ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source  
 Fresh air setting : Close

Cert. No.: 22TM1490  
 Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor k
104.0	104.0	104.0	0.061	1.3	1.7	0.42	2
140.0	140.0	140.0	0.14	2.3	2.4	1.1	2
180.0	180.0	180.0	0.21	3.5	3.6	1.3	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
104.0	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.076	103.876	103.777	104.124	104.667	104.426	104.012	103.928	104.370
140.0	138.199	139.189	138.808	139.550	140.266	139.622	139.293	139.385	140.389
180.0	177.930	179.267	178.643	179.753	181.011	180.093	179.496	179.743	181.278

Average\* : The average of 30 values in each position.  
 Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor  
 Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location, which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
 Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation  
 UUC\* : Unit Under Calibration  
 Note : The reported uncertainty of measurement was included stability and excluded uniformity .  
 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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มูลนิธิพัฒนาอุตสาหกรรมอาหาร  
 Foundation for Industrial Development National Food Institute  
 Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: 2202934-001-01  
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
 Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance  
 Manufacturer: METTLER TOLEDO  
 Model: XSR204  
 Serial No.: C117635043  
 ID No.: UAE.WAS.012/2564  
 Order No.: 2202934  
 Operation No.: 2202934-001  
 Date of Receipt: 13 May 2022  
 Date of Calibration: 13 May 2022

Calibrated by Mr.Manas Somsak Specialist  
 Approved by ( Mr.Pharaphat Tuanjit )  
 Manager, Division of Calibration Laboratory  
 Responsible for the Technical Management Team  
 Date of Issue: 25 May 2022

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme, which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

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 Foundation for Industrial Development National Food Institute  
 Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2202934-001-01  
 Equipment: Electronic Balance  
 Manufacturer: METTLER TOLEDO  
 Model: XSR204  
 Resolution: 0.0001 g  
 Serial No.: C117635043  
 ID No.: UAE.WAS.012/2564  
 Capacity: 220 g

Date of Calibration: 13 May 2022 Page 2 of 4

Environment Condition: Ambient Temperature: 22.3 ± 0.1 °C Relative Humidity: 47 ± 3 %

Place of Calibration: Balance room (Water Analysis Unit), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 - In-House Method based on UKAS Lab 24 : 2019

2. Reference Standards:

Reference Standard Model Serial No Calibrated By Certificate No. Due Date  
 Standard Weight Class E2 1mg to 200g 8805667572 TCS H22041375 23 April 2023

Instrument Model Serial No Calibrated By Certificate No. Due Date  
 Thermo-Hygro Meter RORPE 490 NPLBTH 01V18 Quality Reborn GR22-0350 18 February 2023

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

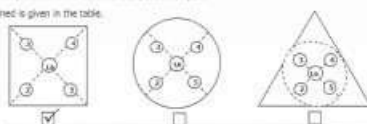
1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.000033
200	0.000032

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 ( g )	2 ( g )	3 ( g )	4 ( g )	5 ( g )	6 ( g )	(Maximum Difference)
50.000	50.000	50.000	50.000	50.000	50.000	0.000

F-CS-012 Revision: 01 Date: 20-04-65

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 Foundation for Industrial Development National Food Institute  
 Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2202934-001-01  
 Equipment: Electronic Balance  
 Manufacturer: METTLER TOLEDO  
 Model: XSR204  
 Resolution: 0.0001 g  
 Serial No.: C117635043  
 ID No.: UAE.WAS.012/2564  
 Capacity: 220 g

Date of Calibration: 13 May 2022 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unread	0.00000	0.00000	0.00000	0.0000005	2.00
0.01	0.01000	0.01000	0.00000	0.0000005	2.00
0.02	0.02000	0.02000	0.00000	0.0000005	2.00
0.05	0.05000	0.05000	0.00000	0.0000005	2.00
0.1	0.10000	0.10000	0.00000	0.0000005	2.00
0.2	0.20000	0.20000	0.00000	0.0000005	2.00
0.5	0.50000	0.50000	0.00000	0.0000005	2.00
1	1.00000	1.00000	0.00000	0.0000006	2.00
2	2.00000	2.00000	0.00000	0.0000006	2.00
3	3.00000	3.00000	0.00000	0.0000007	2.00
5	5.00000	5.00000	0.00000	0.0000007	2.00
10	10.00000	10.00000	0.00000	0.0000008	2.00
20	20.00000	20.00000	0.00000	0.0000009	2.00
30	30.00000	30.00000	-0.00001	0.0000010	2.00
40	40.00000	40.00000	0.00000	0.0000011	2.00
45	45.00000	45.00000	0.00000	0.0000012	2.00

F-CS-012 Revision: 01 Date: 20-04-65

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## Calibration Report

Certificate No.: 2202934-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR204

Resolution: 0.0001 g

Serial No.: C117635943

ID No.: UAE.WAS.012/2564

Capacity: 220 g

Date of Calibration: 13 May 2022

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor K
10	10.00004	10.0001	-0.0001	0.00011	2.00
15	15.00006	15.0001	-0.0001	0.00012	2.00
20	20.00005	20.0001	-0.0001	0.00012	2.00
25	25.00007	25.0002	-0.0001	0.00013	2.00
30	30.00008	30.0002	-0.0001	0.00013	2.00
35	35.00009	35.0002	-0.0001	0.00014	2.00
40	40.00011	40.0002	-0.0001	0.00014	2.00
45	45.00012	45.0002	-0.0001	0.00015	2.00
50	50.00009	50.0002	-0.0001	0.00016	2.00
55	55.00011	55.0002	-0.0001	0.00018	2.00
60	60.00012	60.0002	-0.0001	0.00018	2.00
65	65.00011	65.0002	-0.0001	0.00018	2.00
70	70.00012	70.0002	-0.0001	0.00018	2.00
75	75.00011	75.0002	-0.0001	0.00018	2.00
80	80.00011	80.0002	-0.0001	0.00018	2.00
85	85.00011	85.0002	-0.0001	0.00018	2.00
90	90.00011	90.0002	-0.0001	0.00018	2.00
95	95.00011	95.0002	-0.0001	0.00018	2.00
100	100.00009	100.0001	-0.0001	0.00016	2.00
105	105.00011	105.0002	-0.0001	0.00018	2.00
110	110.00011	110.0002	-0.0001	0.00018	2.00
115	115.00011	115.0002	-0.0001	0.00018	2.00
120	120.00011	120.0002	-0.0001	0.00018	2.00
125	125.00011	125.0002	-0.0001	0.00018	2.00
130	130.00011	130.0002	-0.0001	0.00018	2.00
135	135.00011	135.0002	-0.0001	0.00018	2.00
140	140.00011	140.0002	-0.0001	0.00018	2.00
145	145.00011	145.0002	-0.0001	0.00018	2.00
150	150.00011	150.0002	-0.0001	0.00018	2.00
155	155.00011	155.0002	-0.0001	0.00018	2.00
160	160.00011	160.0002	-0.0001	0.00018	2.00
165	165.00011	165.0002	-0.0001	0.00018	2.00
170	170.00011	170.0002	-0.0001	0.00018	2.00
175	175.00011	175.0002	-0.0001	0.00018	2.00
180	180.00011	180.0002	-0.0001	0.00018	2.00
185	185.00011	185.0002	-0.0001	0.00018	2.00
190	190.00011	190.0002	-0.0001	0.00018	2.00
195	195.00011	195.0002	-0.0001	0.00018	2.00
200	200.00015	200.0004	-0.0003	0.00028	2.00

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 %.

End

FCS-012 Revision: 01 Date: 20-04-05

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
 55/46 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0-2711-3000-27 FAX. 0-2719-9484



## Certificate of Calibration

Cert. No.: 22TM90

Page: 1 of 3

Equipment: BOD Incubator

Manufacturer: Arco

Model: UC4-1320

Serial No.: 13URC45013201

ID No.: UAE.WAO.015/2561

Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangkok, Phrakhanong,  
 Bangkok 10260

Location: Lab Floor 2

Received Order: 17 February 2022

Calibration Date: 17 February 2022

Ambient Temperature: (26 ± 1) °C

Relative Humidity: (50 ± 3) %

Calibrated by: Kunchit Promprat

Approved by:   
 Approved Signatory

( ) Ponnthippa Tameyakul  
 (x) Mailee Buksuea  
 ( ) Suwit Imjai

Issue Date: 22 February 2022

The Uncertainties are for a confidence probability of approximately 95 %.

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 A 0038099



Equipment: BOD Incubator  
 Condition As-Received: Used Item  
 Reference: 2202-0446OC-1

Cert. No.: 22TM90

Page: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument: 34970A Model: MY44035217 Serial No.: 21LM30 Due Date: 23 Dec 2022

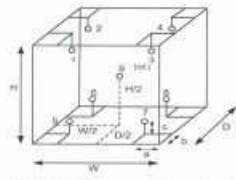
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( ) Without Adjustment

Function of UUC\*: Temperature Source

Fresh air setting: Not Available



Probe Installation Details: Dimension of Chamber:  
 a = 10 cm D = 0.62 m  
 b = 10 cm W = 1.2 m  
 c = 10 cm H = 1.2 m  
 Capacity = 0.89 m³

Environment during calibration	
	Beginning
Temp. (°C)	28
REL.Humid. (%)	68
AC Supply (Volt)	226
	Finished
Temp. (°C)	28
REL.Humid. (%)	75
AC Supply (Volt)	226

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

เอกสารไม่ควบคุม  
 A 1096042



Equipment: BOD Incubator  
 Condition As-Received: Used Item  
 Reference: 2202-0446OC-1

Cert. No.: 22TM90

Page: 3 of 3

Result of Calibration :- ( ) Without Adjustment

Function of UUC\*: Temperature Source

Fresh air setting: Not Available

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.5	19.4	0.30	0.58	1.0	0.55	2

Average\*: The average of 30 values in each position.  
 Temperature stability: One-half of the greatest maximum difference of measured temperature at any one sensor.  
 Temperature uniformity: The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
 Overall Variation: The Difference of the maximum and minimum measured temperatures throughout observation.  
 UUC\*: Unit Under Calibration  
 Note: The reported uncertainty of measurement was included stability and excluded uniformity.

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

เอกสารไม่ควบคุม  
 A 1096041



**CERTIFICATE OF CALIBRATION**

**Equipment :** COD Test Tube Heater  
**Meter Model :** HI839800-02 **Serial No. :** H0185001  
**Manufacturer :** Hanna Instruments  
**Made in :** Romania  
**Condition As-Received :** Used Product  
**Reference :** RE220234  
**Customer name :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,  
Phrakhanong, Bangkok 10260  
**Received date :** 21 February 2022  
**Calibrate date :** 1 March 2022  
**Issue date :** 2 March 2022  
**Ambient Temperature :**  $(25 \pm 2) ^\circ\text{C}$   
**Relative Humidity :**  $(50 \pm 15) \% \text{ RH}$   
**Calibrated Location :** Hanna Instruments (Thailand) Ltd.

**Calibrated by :**  **Approved by :**   
Mr. Pichit Petthong Mr. Anan Suwanchaisakul  
Calibration Engineer Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

**\*\* This certificate may not be reproduced other than in full, except with the prior written approval of the head of Hanna Instrument (Thailand) \*\***

เอกสารไม่ควบคุม

**Condition of this result of calibration**
**Reference Standard Instruments :**

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	21T167	Technology Promotion Association ( Thailand-Japan )

**Reference / Procedure :**

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141.

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

**SITE CALIBRATION**

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

เอกสารไม่ควบคุม

**Result of Calibration :**

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 ( $^{\circ}\text{C}$ )	$^{\circ}\text{C}$	150.6 ( $^{\circ}\text{C}$ )	1.3 ( $^{\circ}\text{C}$ )	$\pm 0.39 (^{\circ}\text{C})$

Calibration Point ( $^{\circ}\text{C}$ )	Average Standard Reading ( $^{\circ}\text{C}$ )				
	Position				
150.0	1	2	3	4	5
	150.2	150.4	150.4	150.3	150.2
	6	7	8	9	10
	150.4	150.9	151.1	151.1	150.6
	11	12	13	14	15
	150.4	151.0	151.5	151.3	150.5
	16	17	18	19	20
	150.3	150.8	151.2	151.2	150.5
	21	22	23	24	25
	150.2	150.3	150.5	150.4	150.3

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

**\*\* End of certificate \*\***

เอกสารไม่ควบคุม

**CERTIFICATE OF CALIBRATION**

Certificate No. : SP22-016

Page : 1 of 5

**Customer :** United Analyst and Engineering Consultant Co., Ltd. (Head Office)

**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,  
Bangkok 10260

**Location of calibration :** Laboratory 315

**Equipment :** UV-Vis Spectrophotometer

**Manufacturer :** Agilent Technologies

**Model :** Cary 60

**Serial No. :** MY15410009



**ID No. :** N/A

**Received Date :** 23 May 2022

**Calibration Date :** 23 May 2022

**Issue Date :** 26 May 2022

**Condition Instrument :** Good

**Calibrated by :**  **Approved by :**   
(Mr. Tanawat Rittidach) (Ms. Chonithich Sangngem)  
Technical Manager Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards used to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

เอกสารไม่ควบคุม



## REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 2 of 5

Environment Condition : Ambient Temperature  $25 \pm 5$  °CRelative humidity  $55 \pm 20$  %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Sturna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 90 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC: Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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FM-708-02 Rev1 1/11/2021



## REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5787	0.5755	0.0032	0.0031	2.00
	1.0490	1.0436	0.0054	0.0029	2.00
	2.1900	2.1847	0.0053	0.0075	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5607	0.5588	0.0019	0.0034	2.00
	1.0247	1.0232	0.0015	0.0035	2.00
	2.1229	2.1211	0.0018	0.0082	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5236	0.5197	0.0039	0.0029	2.00
	0.9634	0.9625	0.0009	0.0028	2.00
	1.9763	1.9752	0.0011	0.0070	2.00
546.1	0.0000	-0.0001	0.0001	0.0028	2.00
	0.5191	0.5171	0.0020	0.0031	2.00
	1.0003	0.9984	0.0019	0.0033	2.00
	1.9987	1.9946	0.0041	0.0084	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5523	0.5509	0.0014	0.0030	2.00
	1.0809	1.0799	0.0010	0.0029	2.00
	2.0391	2.0329	0.0062	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5601	0.5584	0.0017	0.0031	2.00
	1.0512	1.0498	0.0014	0.0029	2.00
	1.9294	1.9265	0.0029	0.0082	2.00

เอกสารไม่ควบคุม

FM-708-02 Rev1 1/11/2021



## REPORT OF CALIBRATION

Certificate No. : SP22-016

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0001	-0.0001	0.0050	2.00
	0.7478	0.7421	0.0057	0.0056	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8686	0.8619	0.0067	0.0059	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2912	0.2896	0.0016	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6448	0.6403	0.0045	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 Rev1 1/11/2021



## REPORT OF CALIBRATION

Certificate No. : SP22-016

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.5	0.31	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.4	0.54	0.18	2.00
453.66	453.2	0.46	0.18	2.00
460.02	459.7	0.32	0.18	2.00
536.59	536.2	0.39	0.18	2.00
637.98	638.3	-0.32	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.5	-0.03	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.7	-0.30	0.18	2.00
740.72	740.8	-0.08	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.0	0.28	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- \* Indicates not TIS accredited

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 Rev1 1/11/2021

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

**CERTIFICATE OF CALIBRATION**

Certificate No. : SP22-007 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,  
Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064



ID No. : UAE.WAS.006/2552

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by :  Approved by :   
(Mr. Tanasut Rintach) (Ms. Chonticha Sangsri)  
Technical Manager Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement method at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

PM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

**REPORT OF CALIBRATION**

Certificate No. : SP22-007 Page 2 of 5

Environment Condition: Ambient Temperature  $25 \pm 5$  °C  
Relative humidity  $55 \pm 20$  %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability This certification is traceable to the International System of Unit maintained at National -  
Institute of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.  
Wavelength 0.1 nm.

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

**REPORT OF CALIBRATION**

Certificate No. SP22-007 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.577	0.0017	0.0031	2.00
	1.0490	1.050	-0.0010	0.0029	2.00
	2.1900	2.183	0.0070	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.560	0.0007	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.118	0.0049	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.963	0.0004	0.0029	2.00
	1.9763	1.974	0.0023	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	1.000	0.0003	0.0033	2.00
	1.9987	1.996	0.0027	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.082	-0.0011	0.0030	2.00
	2.0391	2.033	0.0061	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.925	0.0044	0.0079	2.00

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

**REPORT OF CALIBRATION**

Certificate No. SP22-007 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.746	0.0018	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.861	0.0076	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.291	0.0002	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.638	0.0068	0.0055	2.00

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม





## REPORT OF CALIBRATION

Certificate No. SP22-007

Page 5 of 5

### Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	240.8	0.74	0.18	2.00
279.40	278.5	0.90	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.5	0.72	0.18	2.00
361.26	360.5	0.76	0.18	2.00
418.48	418.0	0.48	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.0	0.20	0.18	2.00
460.06	459.5	0.56	0.18	2.00
536.90	536.0	0.90	0.18	2.00
637.94	637.2	0.74	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.6	0.62	0.18	2.00
513.70	513.0	0.70	0.18	2.00
528.72	528.0	0.72	0.18	2.00
574.60	573.8	0.80	0.18	2.00
585.48	584.6	0.88	0.20	2.00
684.63	684.0	0.63	0.18	2.00
740.27	739.8	0.47	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.4	0.76	0.18	2.00
879.70	878.8	0.90	0.18	2.00

Remark : -UUC = Unc Under Calibration

-N/A = Not Available

-The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

-\* Indicates non TSI accredited

- End of Certificate -

FM-209-02 R01 1/11/2003

เอกสารไม่ควบคุม

## Certificate of System Qualification

GC-DQ

System ID: CN11021007  
Organization Name: United Analyst and Engineering Consultan Co., Ltd.  
Organization Location: 3 Soi Udomsuk 41 Sukhumvit Rd., Bangkok, Bangkok Thailand 10260

Date: February 11, 2022 3:57:27 PM  
EQP Name: AgilentRecommended  
EQP Revision: GC.02.51  
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: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.0 psi

Accuracy: 0.0 psi  
Agilent Recommended: <= 1.2

### Overall Inlet Pressure Accuracy Test Status

Pass

### Detector Flow Accuracy

Name: 7890  
Back FID

Setpoint Status: Pass  
Flow Type: Fuel  
Setpoint: 30.0 mL/min Measured Flow: 30.1 mL/min  
Accuracy: 0.1 mL/min  
Agilent Recommended: <= 10.0 % setpoint ( 3.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass  
Flow Type: Oxidizer  
Setpoint: 400.0 mL/min Measured Flow: 396.4 mL/min  
Accuracy: 3.6 mL/min  
Agilent Recommended: <= 10.0 % setpoint ( 40.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass  
Flow Type: Makeup  
Setpoint: 25.0 mL/min Measured Flow: 24.8 mL/min  
Accuracy: 0.2 mL/min  
Agilent Recommended: <= 10.0 % setpoint ( 2.5 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม

### Overall Detector Flow Accuracy Test Status

Pass

### Detector Flow Accuracy

Name: 7890  
Front UECD  
Setpoint Status: Pass  
Flow Type: Makeup  
Setpoint: 25.0 mL/min Measured Flow: 24.8 mL/min  
Accuracy: 0.2 mL/min  
Agilent Recommended: <= 10.0 % setpoint ( 2.5 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

### Overall Detector Flow Accuracy Test Status

Pass

### GC Oven Temperature Accuracy

Name: 7890  
Setpoint Status: Pass  
Zone: Oven  
Setpoint/Actual  
Temperature: 230.0 230.3  
Accuracy: 0.3  
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: 100.0 100.2  
Accuracy: 0.2  
Agilent Recommended: >= -1.0 % setpoint in K ( -3.7 °C )  
<= 1.0 % setpoint in K ( 3.7 °C )

Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม



## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Temperature: 100.0 100.2167 °C

Stability: 0.1 °C

Agilent Recommended: &lt;= 0.5

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1 Front SSL / Back FID

Injection Tower

Name: 7683A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1 Front SSL / Back FID

Name: 7890

Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม

Setpoint Status: Pass

Base Signal: 11.2 pA

ASTM Noise  
pA  
0.06

Agilent Recommended: &lt;= 0.10

Status: Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1 Front SSL / Back FID

Name: 7683A

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 0.38 % Retention Time RSD: 0.05 %

Agilent Recommended: &lt;= 3.00 &lt;= 1.00

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Tested Combination1 Front SSL / Back FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 784901

Agilent Recommended: &gt;= 300000

## Overall Signal to Noise Test Status

Pass

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## Scouting Run

Tested Combination2 Front SSL / Front UECD

Injection Tower

Name: 7683A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination2 Front SSL / Front UECD

Name: 7890

Setpoint Status: Pass

Base Signal: 282.3 Hz

ASTM Noise  
Hz  
0.60

Agilent Recommended: &lt;= 3.00

Status: Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination2 Front SSL / Front UECD

Name: 7683A

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เอกสารไม่ควบคุม

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 1.14 % Retention Time RSD: 0.04 %

Agilent Recommended: &lt;= 3.00 &lt;= 1.00

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Tested Combination2 Front SSL / Front UECD

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 2250

Agilent Recommended: &gt;= 1500

## Overall Signal to Noise Test Status

Pass

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## Instrument Details

## Purpose

This section describes the as found system configuration.

## Details

## System

System ID	UAE.TOX.007
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

## Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	Back
LTM Included?	No

## Tested Combination2

Injection Technique	Injection Tower
Inlet	Front
Detector	Front
LTM Included?	No

## Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7890
Model Number	G2613A
Serial Number	CN82149436
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

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## Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7890
Model Number	G2614A
Serial Number	CN82248787
Firmware Revision	A.02.01

## Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11021007
Firmware Revision	A.01.11
Oven Type	Standard

## Inlet 1

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

## Detector 1

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

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System ID: CN11021007

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## Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	LIECD
Serial Number	U116885
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

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## Electronic Signature

## Purpose

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

## Details

Full Name of Signer:	Saenguthai Tarak
Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	February 11, 2022
Reason for Signature:	Executed protocol and published this original version of document

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System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: saengpattalarak

Hostname: LAPTOP-QG38K0MY

System ID: CN11021007

Print Date: February 11, 2022 3:57:39 PM

DQ\_UAE\_TOX.687 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 10, 2022 1:31:02 PM	Auth	Session Created	Session	None
February 10, 2022 1:31:02 PM	Start	Configuration	Session	None
February 10, 2022 1:31:02 PM	Auth	Enrollment	Licensing	User is Nonpaying and does not require an unlock code
February 10, 2022 1:30:00 PM	Auth	ExpLoaded	Session	EQP details for primary technique [GC] - File path: [ProtocolPacks\GC\Config\Items\02_01\GC_02_01.apg] EQP File Name: [GC_02_01.apg], EQP Name: [AgilentRecommended]
February 10, 2022 1:30:40 PM	Auth	AccClosed	Session	None
February 10, 2022 1:41:39 PM	Auth	AccRestarted	Session	None
February 10, 2022 1:41:39 PM	Auth	SessionReloading	Session	None
February 10, 2022 1:41:10 PM	Auth	ExpLoaded	Session	EQP details for primary technique [GC] - File path: [ProtocolPacks\GC\Config\Items\02_01\GC_02_01.apg] EQP File Name: [GC_02_01.apg], EQP Name: [AgilentRecommended]
February 10, 2022 1:47:12 PM	Auth	AccClosed	Session	None
February 11, 2022 9:04:43 AM	Auth	AccRestarted	Session	None

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Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: saengpattalarak

Hostname: LAPTOP-QG38K0MY

System ID: CN11021007

Print Date: February 11, 2022 3:57:39 PM

DQ\_UAE\_TOX.687 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:06:30 PM	Auth	SessionReloading	Session	None
February 11, 2022 2:06:21 PM	Auth	ExpLoaded	Session	EQP details for primary technique [GC] - File path: [ProtocolPacks\GC\Config\Items\02_01\GC_02_01.apg] EQP File Name: [GC_02_01.apg], EQP Name: [AgilentRecommended]
February 11, 2022 2:06:55 PM	End	Configuration	Session	None
February 11, 2022 2:06:50 PM	Start	Qualification	Session	QC
February 11, 2022 2:06:50 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7850 - Qualitative Test - No setpoints associated	None
February 11, 2022 2:07:18 PM	End	Execution	System Inspection and Basic Safety and Operation - 7850 - Qualitative Test - No setpoints associated	Run Count: 1
February 11, 2022 2:07:21 PM	Start	Execution	Inlet Pressure Decay - Front SRA - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 0.5 psi and +/- 0.5 psi	None
February 11, 2022 2:07:36 PM	End	Execution	Inlet Pressure Decay - Front SRA - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 0.5 psi and +/- 0.5 psi	Run Count: 1
February 11, 2022 2:07:37 PM	Start	Execution	Inlet Pressure Accuracy - Front SRA - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 1.0 psi	None

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System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: saengpattalarak

Hostname: LAPTOP-QG38K0MY

System ID: CN11021007

Print Date: February 11, 2022 3:57:39 PM

DQ\_UAE\_TOX.687 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:07:42 PM	End	Execution	Inlet Pressure Accuracy - Front SRA - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 1.0 psi	Run Count: 1
February 11, 2022 2:07:44 PM	Start	Execution	Detector Flow Accuracy - Back PID - Type: Fluid - S: 30.0 mL/min - L: +/- 10.0% setpoint	None
February 11, 2022 2:08:02 PM	Auth	Data	Detector Flow Accuracy - Back PID - Type: Fluid - S: 30.0 mL/min - L: +/- 10.0% setpoint	Manual Data Entry
February 11, 2022 2:08:10 PM	End	Execution	Detector Flow Accuracy - Back PID - Type: Fluid - S: 30.0 mL/min - L: +/- 10.0% setpoint	Run Count: 1
February 11, 2022 2:08:12 PM	Start	Execution	Detector Flow Accuracy - Back PID - Type: Outflow - S: 400.0 mL/min - L: +/- 10.0% setpoint	None
February 11, 2022 2:08:45 PM	Auth	Data	Detector Flow Accuracy - Back PID - Type: Outflow - S: 400.0 mL/min - L: +/- 10.0% setpoint	Manual Data Entry
February 11, 2022 2:09:52 PM	End	Execution	Detector Flow Accuracy - Back PID - Type: Outflow - S: 400.0 mL/min - L: +/- 10.0% setpoint	Run Count: 1
February 11, 2022 2:09:56 PM	Start	Execution	Detector Flow Accuracy - Back PID - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	None
February 11, 2022 2:09:18 PM	Auth	Data	Detector Flow Accuracy - Back PID - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	Manual Data Entry
February 11, 2022 2:09:23 PM	End	Execution	Detector Flow Accuracy - Back PID - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	Run Count: 1

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User Name: saengpattarak

Hostname: LAPTOP-QG38K0MY

System ID: CN11021007

Print Date: February 11, 2022 3:57:39 PM

DQ\_UAE\_TOX.687 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:09:25 PM	Start	Execution	Detector Flow Accuracy - Front UECD - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	None
February 11, 2022 2:09:50 PM	Auth	Data	Detector Flow Accuracy - Front UECD - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	Manual Data Entry
February 11, 2022 2:09:54 PM	End	Execution	Detector Flow Accuracy - Front UECD - Type: Makeup - S: 25.0 mL/min - L: +/- 10.0% setpoint	Run Count: 1
February 11, 2022 2:09:56 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
February 11, 2022 2:10:18 PM	Auth	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry
February 11, 2022 2:10:20 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Run Count: 1
February 11, 2022 2:10:25 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 100.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
February 11, 2022 2:10:41 PM	Auth	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 100.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry

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User Name: saengratlab Hostname: LAPTOP-CQ35KQWY		System ID: CN11021007 Print Date: February 11, 2022 3:57:38 PM		
OQ_UAE_TOX.897 Transaction log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:10:43 PM	End	Execution	GC Oven Temperature Accuracy - 7800 - Temperature - Over - S: 100.0°C - L: <= -1.0 AND <= 1.0 % setpoint at K	Run Count: 1
February 11, 2022 2:10:46 PM	Start	Execution	GC Oven Temperature Stability - 7800 - Temperature - Over - S: 100.0°C - L: <= 0.0°C	None
February 11, 2022 2:11:37 PM	Audit	Date	GC Oven Temperature Stability - 7800 - Temperature - Over - S: 100.0°C - L: <= 0.0°C	Manual Data Entry
February 11, 2022 2:11:38 PM	End	Execution	GC Oven Temperature Stability - 7800 - Temperature - Over - S: 100.0°C - L: <= 0.0°C	Run Count: 1
February 11, 2022 2:11:44 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSI, Back FID - Part of System Preparation - No limits associated	None
February 11, 2022 2:14:18 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSI, Back FID - Part of System Preparation - No limits associated	None
February 11, 2022 2:14:48 PM	Audit	Date	GC Scouting Run - Injection Tower, Front SSI, Back FID - Part of System Preparation - No limits associated	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:15:18 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSI, Back FID - Part of System Preparation - No limits associated	Run Count: 1
February 11, 2022 2:15:22 PM	Start	Execution	Noise and Offset - Back FID - Detector FID - L (Noise) <= 5.10 pA - L (Offset) <= 2.50	None

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System ID: CN11021007

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User Name: saengratlab Hostname: LAPTOP-CQ35KQWY		System ID: CN11021007 Print Date: February 11, 2022 3:57:38 PM		
OQ_UAE_TOX.897 Transaction log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:15:07 PM	Audit	Date	Noise and Offset - Back FID - Detector FID - L (Noise) <= 5.10 pA - L (Offset) <= 2.50 pA/Hz	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%
February 11, 2022 2:18:06 PM	End	Execution	Noise and Offset - Back FID - Detector FID - L (Noise) <= 5.10 pA - L (Offset) <= 2.50 pA/Hz	Run Count: 1
February 11, 2022 2:18:08 PM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
February 11, 2022 2:18:47 PM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None
February 11, 2022 2:17:12 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:17:12 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:17:13 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch

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User Name: saengratlab

Hostname: LAPTOP-CQ35KQWY

System ID: CN11021007

Print Date: February 11, 2022 3:57:30 PM

OQ\_UAE\_TOX.897 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:17:12 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:17:12 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:17:12 PM	Audit	Date	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:17:35 PM	End	Execution	Injection Precision - Injection Tower, Front SSI, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
February 11, 2022 2:17:46 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSI, Back FID - Detector FID - L >= 300000	None
February 11, 2022 2:18:06 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSI, Back FID - Detector FID - L >= 300000	None
February 11, 2022 2:18:23 PM	Audit	Date	Signal to Noise - Injection Tower, Front SSI, Back FID - Detector FID - L >= 300000	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:19:02 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSI, Back FID - Detector FID - L >= 300000	None

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Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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User Name: saengratlab  
 Hostname: LAPTOP-CQ35KQWY

System ID: CN11021007

Print Date: February 11, 2022 3:57:30 PM

OQ\_UAE\_TOX.897 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:19:11 PM	End	Execution	Signal to Noise - Injection Tower, Front SSI, Back FID - Detector FID - L >= 300000	Run Count: 1
February 11, 2022 2:21:48 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSI, Front UECD - Part of System Preparation - No limits associated	None
February 11, 2022 2:22:15 PM	Audit	Date	GC Scouting Run - Injection Tower, Front SSI, Front UECD - Part of System Preparation - No limits associated	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:22:31 PM	Audit	Date	GC Scouting Run - Injection Tower, Front SSI, Front UECD - Part of System Preparation - No limits associated	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:22:36 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSI, Front UECD - Part of System Preparation - No limits associated	Run Count: 1
February 11, 2022 2:23:26 PM	Start	Execution	Noise and Offset - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Offset) <= 15.00 Hz/Hz	None
February 11, 2022 2:23:47 PM	Audit	Date	Noise and Offset - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Offset) <= 15.00 Hz/Hz	Data File Path: E:\OQ2022\OQ2022 GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00% 13-02-14OQ_GCT980_FID_Phd108.D\FID18.ch
February 11, 2022 2:25:55 PM	End	Execution	Noise and Offset - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Offset) <= 15.00 Hz/Hz	Run Count: 1

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Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: saangulal@carv  
 Hostname: LAPTOP-CQ358K0M

System ID: CN1921087  
 Print Date: February 11, 2022 3:57:38 PM

CQ\_UAR\_TOX.897 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 3:34:01 PM	Start	Execution	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	None
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6103.DEC01A.sh
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6104.DEC01A.sh
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6105.DEC01A.sh
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6106.DEC01A.sh
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6107.DEC01A.sh
February 11, 2022 3:34:42 PM	Auto	Data	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Data File Path: E:\CG2022\CQ_UCT890_uE CQ_Pw6108.DEC01A.sh
February 11, 2022 3:35:20 PM	End	Execution	Injection PreInjection - Injection Tweak: Front SSL, Front UICD - GC - L (Aveq) == 3.00% - L (Rel. Time) == 1.00%	Run Count: 1

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Date: February 11, 2022 3:57:27 PM  
System ID: CN11021007

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## เอกสารไม่ควบคุม

User Name: idanguthatank

System ID: CM11621887

Hostname: LAPTOP-CQ3H8QMY

Print Date: February 11, 2022 2:57:30 PM

OQ\_UAQE\_TOX##? Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 11, 2022 2:30:55 AM	Start PM	Execution	Signal to Noise - Injection Tower, Front SSL, Front UCCO - Detector UCCO - L1 == 1500	None
February 11, 2022 2:36:19 AM	Auto PM	Data	Signal to Noise - Injection Tower, Front SSL, Front UCCO: K=Q92029(OQ_IG7PM)_U - Detector UCCO - L1 == 1500 CD_BND1(DECCO(A,C))	Data Rec Park
February 11, 2022 2:38:38 AM	End PM	Execution	Signal to Noise - Injection Tower, Front SSL, Front UCCO - Detector UCCO - L1 == 1500	Run Count: 1
February 11, 2022 2:37:52 PM	End PM	Qualification	Session	OQ
February 11, 2022 2:37:32 PM	Start PM	Reporting	Session	None
February 11, 2022 2:40:40 PM	Auto PM	Reporting	Session	Report Generated - Certificate
February 11, 2022 2:56:02 PM	Auto PM	Reporting	Session	Report Generated - Report

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Date: February 11, 2023 3:57:27 PM  
System ID: CN11021007

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## เอกสารไม่ควบคุม



## Agilent 8890 Gas Chromatograph Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results. Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

### Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <https://www.agilent.com/en-us/products/crosslab-instrument-services/service-portal>
- To access **Agilent University**, visit <https://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? - visit our **Support Home page** <https://www.agilent.com/search/support>



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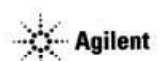


### Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

### Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.



## เอกสารไม่ควบคุม

## System Information

- ☒ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument system name and ID	GC 8890
Instrument system site and location	UAE
List system component product numbers	List the serial numbers of each component
1. G3572A	1. CN1945A066
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

## Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

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## PM Procedure

### Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed, off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

### Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance using the Maintenance procedure from either the Touchscreen or Browser User interfaces. Record the results. (Leak and Restriction Test)
- ☒ Replace the split vent trap cartridge filter using the Maintenance procedure from either the Touchscreen or Browser User interfaces on units with these inlets: Split/Spitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI). Record the results. (Leak and Restriction Test)
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination - clean as necessary.

### Zero Sensors and Leak test

- ☒ Zero all pressure sensors using the Touchscreen User interface.
- ☒ Perform inlet pressure decay test(s) from the diagnostics screen on either the Touchscreen or Browser User interface. Record if test passed or failed in the results table.
- ☒ Note: If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.

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## ALS Maintenance

- ☒ **Section NOT applicable**
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or removed any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringes for smooth plunger operation.
- ☐ Check for smooth operation of the needle support - clean if necessary

## Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the touchscreen interface or Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values. Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

## Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
- ☐ Please ask the customer if they would like to have Smart Alerts installed on their computer.

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## PM Test Results Table

Test description	Before PM Service	After PM Service
Front detector output	N/A	N/A
Back detector output	N/A	N/A
AUX 1 detector output	N/A	N/A
AUX 2 detector output	N/A	N/A
Test description	Expected test result	Actual test result
Leak and Restriction Test after front inlet maintenance	Pass	
Leak and Restriction Test after back inlet maintenance	Pass	N/A
Leak and Restriction Test after front inlet Split Vent Trap replacement	Pass	
Leak and Restriction Test after back inlet Split Vent Trap replacement	Pass	N/A
Front inlet pressure decay test	Pass	
Back inlet pressure decay test	Pass	N/A

## PM Parts List Table

Note: The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part description	Part number	Product or model where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	8890 GC	1
SSL Capillary Inlet PM kit, Split	5188-6496	8890 GC	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	8890 GC	-
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	8890 GC	-
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	8890 GC	-

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Part description	Part number	Product or models where used	Quantity consumed
PP Inlet PM kit	5188-6498	8890 GC	—
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	8890 GC	—
MMI Cleaning Kit	G3510-60820	8890 GC	—
PTV Septumless Head Rebuild Kit	5182-9747	8890 GC	—
PTV Septumless Head Teflon Guide	5182-9748	8890 GC	—
Ignitor (glow plug) assembly with O-ring	19231-60680	8890 GC	—
FID Collector Rebuild/Cleaning Kit	G1531-67000	8890 GC	—
FID Collector Replacement Kit	G1531-67001	8890 GC	—
Standard .011-inch FID Jet	G4591-20320	8890 GC	—

#### Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

#### Service Completion

Service request number: 6005380758 Date service completed: 15 Jun 2022

Agilent signature: [Signature] Customer signature: \_\_\_\_\_

Total number of pages in this document: 7

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#### Document Control Logs

##### Revision Log

Revision	Date	Reason for update
Add revision number of document here	Date of issuance	Author to describe main features/changes made for this specific revision
1.00	02-Jan-2019	Initial Release

##### Approval Log

Revision	Approver	Title of approver
Add revision number	Add approver name here	Add approver's function or title here
1.00	Suneetha Tippireddy	GC and GCMS Product Support Manager

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Document part number: G3049-90000



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#### Agilent GC/MS Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to ensure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

#### Select the appropriate PM to be done and then perform the checklist under that section.

- ☐ Interim Preventive Maintenance 6 months  
☐ Major Preventive Maintenance Yearly

#### This checklist covers the following model(s):

Type	Model
SQ	5873 Series MSD
SQ	5875 Series MSD
SQ	5877 Series MSD
TQ	7000 Series MS/MS
TQ	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

Definition of the Task/Recommended items within the document.

Task	Recommended	
Yes	No	Interim/Major/As needed
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Yes</b> selected means that the task was done or the part was required.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>No</b> selected means that the task was not done or the part was required.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Means that this task is recommended to be done at 6-month intervals.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <b>As needed</b> means that the task was done or the part was used as needed. Could be two types of filters could be used and this was the one which was selected.

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<http://www.cham.agilent.com/en-us/products/services/pages/default.aspx>

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#### Agilent GC/MS Preventive Maintenance Checklist

#### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts not listed in the Parts Lists section of this document, are not included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

#### Service Engineer Responsibilities

- Print out all pages of the document and complete sections that relate to the system being installed.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using X or tick mark ✓ in the checkbox.
- Check the Not Applicable check boxes or specify N/A (where appropriate) to indicate optional services not delivered.
- Complete the Service Review and Service Completion sections together with the customer.

#### Additional Instruction Notes

Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electro-mechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. **Two preventive maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.**

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# Agilent GC/MS Preventive Maintenance Checklist

## System Information

System Name and ID	System Site and Location
MSD 5977B	UAE

## System Components

☐ Check this box if an instrument configuration report is attached instead of completing the table.

List system component product numbers	List the serial numbers of each component
1. G7077B	1. U5100AM037
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

## Preparation

- ☒ Discuss any specific issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform general inspection of system for cleanliness.
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc.
- ☒ Check for required firmware updates and verify with customers if they would like it installed.

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# Agilent GC/MS Preventive Maintenance Checklist

## Preventive Maintenance for MSs

### Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables and usage dependent items such as gases, vials, syringes, calibrant solution and solvents required for the successful preventive maintenance are available. A customer representative should be available while the preventive maintenance procedure is being performed.

### Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☒ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: It is recommended to have the customer run the autotune and tune evaluation the night prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

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# Agilent GC/MS Preventive Maintenance Checklist

## Parts – Included and as needed as part of the preventive maintenance

### Common MS Maintenance Supplies

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Aluminum paper, 20 µm	5001-5430
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Alumina powder	503703201
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, clean (package of 15)	50981-60651
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, cleaning (package of 300)	5010-4826
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cotton swabs (package of 100)	5080-5400
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, large	5050-0130
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, small	5050-0128
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Grease, Apiezon L, high vacuum	5042-3289

### Common MS Filters and Seals – 5873/5875/5877/7000/7010/7200/7250 Series

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Helium gas filter – if required	RMSH-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter – if required	RMSN-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" Hg, Hydrogen – if required	RMSHY-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Carrier Gas Kit for 7000 for Nitrogen or Helium: Bracket, Mount, and Filter – if required	CP17988
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Filter kit GC/MS 1/8 in (complete replacement kit) – if required	CP17974
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean GS/MS Filter – if required	CP17973
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chemical Ionization Gas Purifier (CI system) – if required	5160-9471
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Forkline Pump Oil Inlet 45	5040-0334

### MS Maintenance Supplies for 5873/5875/5877

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Diffusion pump fluid (Diffusion Pump Models)	5040-0495 Dry 2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Pump Models)	52677-42318
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS42 Oil Mist Eliminator 3/4" & 3/8"	5010709156
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Exhaust oil mist trap (thread) Edwards/Pfeiffer	01550-80378

### MS Maintenance Supplies for 7000/7010

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oil Mist Filter PVS	50400-80343

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# Agilent GC/MS Preventive Maintenance Checklist

## MS Maintenance Supplies for 7200/7250

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RIS Probe Maintenance Kit (7200 Series only)	G7095-60178
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS282 Oil Mist Eliminator	5023709896
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Pump Models)	X3815-67000
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Filter element, for SH-110/SH-112/IDP-15 exhaust silencer	REPLSLRFLTR1
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OS 3/8" MAG. PLUG AND GASKET	5063701824

## MS Maintenance Supplies for JetClean

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" Hg, Hydrogen – if required	RMSHY-2

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# Agilent GC/MS Preventive Maintenance Checklist



Parts – Needs be purchased if found defective or worn out

## Common MSD Maintenance Supplies 5873/5875/5877/7000/7016/7200/7250

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> B1 High Temperature Filaments	G7005-63961 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> HES E1 Filaments	G7002-63961
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> L5-E1 Filaments	G7005-63972
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 High Temperature Filament – all MSDs	G7005-63972
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> PFTSA GC/MS Tuning Standard calibration	95071-69571
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> PFTD calibration, 1 ml	95060-69519
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> PFTT, IRM calibration for GC QTOF 0.5 ml	5190-0531

## MS Maintenance Supplies for 5873/5875/5877

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal (tip and spring combo)	G1998-60412
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal (tip only)	G3876-20542
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal (spring only)	G1998-20023
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Regulator Insulator	G1086-20133 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Lens Insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ring heater/sensor assembly (HES)	G7002-40043
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ceramic Insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Cap, Threaded	G3876-20547
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Base, Threaded	G3876-20548

## MS Maintenance Supplies for 7000/7016

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal - 7000	G1998-60412
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal - 7016	G7002-40412
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal (tip only)	G3876-20542
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> C1 Interface tip seal (spring only)	G1998-20023
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Regulator Insulator - 7000	G1086-20133 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Lens Insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ring heater/sensor assembly (HES)	G7002-40043
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ceramic Insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Cap, Threaded	G3876-20547
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Base, Threaded	G3876-20548

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# Agilent GC/MS Preventive Maintenance Checklist



## MS Maintenance Supplies for 7200

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Extractor Lens Insulator	G7005-20133
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ion Focus Insulator	G7005-20442
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ring Heater/Sensor Assembly	G7005-40110
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> RIS X-ray Tip	G7005-20442
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> RIS X-ray Tip Spring	G7005-20424

## MS Maintenance Supplies for 7250

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Lens Insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ring heater/sensor assembly (HES)	G7002-40043
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Ceramic Insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Cap, Threaded	G3876-20547
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Transfer-Line Tip Base, Threaded	G3876-20548
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> E1 Extractor Transfer Tip	G3876-20542
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> D Tip Compression Spring	G1999-20023

## MS Maintenance Supplies for Intuvo 9000 MS Systems

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Swaged MS Tail - Packaged	G4516-60009
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Swaged MS Tail (HES) - Packaged	G4516-60109

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# Agilent GC/MS Preventive Maintenance Checklist



## Preventive Maintenance Checklist:

Yes/No	Interim/Major	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Perform general inspection of system for cleanliness.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Discuss any problems the customer is having with the instrument.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Review customer maintenance records and exclude maintenance on recently serviced items.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.

Yes/No	Interim/Major	GC/MS Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Record instrument model no. G7077 II
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Record instrument serial no. 61570284037
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Record Rough Vacuum. -
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Record Manifold Vacuum. -
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Type of Column installed. DB - 624

Yes/No	Interim/Major	System Checks Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Check manually that you have calibration peaks.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Vent the instrument.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Inspect vacuum hoses, pump exhaust tubing and power cords for excessive wear.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Visually inspect the calibration levels – PFTSA, PFTD (if appl), IRM (if appl). Refill if necessary.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Look for any obvious external damage or problems.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Verify system line voltage meets instrument specifications: Yes <input type="checkbox"/> No <input type="checkbox"/>

Yes/No	Interim/Major	Wet Mechanical vacuum pumps Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Check for evidence of oil leakage. Check pump gasket for leakage.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Drain and replace mechanical pump oil.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace Oil Mist Filter if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Discuss with customer the need for more frequent oil changes if the oil is dirty.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Demonstrate ballast, if requested.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Anti-suckback test.

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Diaphragm Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Check for evidence of poor vacuum - Turbo Power Demand, poor manifold vacuum, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> If vacuum is poor, then replace the diaphragm pump.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Anti-suckback test.

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# Agilent GC/MS Preventive Maintenance Checklist



Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Scroll Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace the tip seal on the IDP pump.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Check for evidence of poor vacuum - Turbo Power Demand, poor manifold vacuum.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace the Exhaust Filter if required.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Discuss with customer the need for more frequent changes if needed.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Inform customer that pump gas ballast should be installed all the time.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Anti-suckback test.

Yes/No	Interim/Major	Cleaning System and Filters Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Fans
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Remove dust from fans and vent covers.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Fans are functional, area is cleared around fans.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Source Cleaning
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Open analyzer and remove the source.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Disassemble, Clean, Re-assemble source.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Re-install source and close analyzer.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Filters
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace RSMH-2 Helium gas filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace RSMH-2 Nitrogen gas filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Replace RSMH-2 Hydrogen gas filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> CP17986 - Gas Clean Carrier Gas Kit for Nitrogen or Helium; Bracket, Mount, and Filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> CP17974 - Gas Clean Filter Kit GC/MS 1/8 in; Mount and Filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> CP17973 - Gas Clean Filter, Replacement Filter - if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 5190-8071 - Methane Gas Filter - if applicable.

Yes/No	Interim/Major	System post-check Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Pump system back down. Wait until system stability has been achieved.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Verify system vacuum reading(s) via the gauge controller.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Leak Check
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Verify system in manual tune
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Compare against previous tune file report(s)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Check manually that you have calibration peaks.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> E1 Autotune Performed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Rough Vacuum
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Vacuum Manifold
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> High Vacuum

Guidance: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the PM Service activity in the customer's instrument records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Review Comments section below if there are additional comments.
- ☒ Review the service and any test results with the customer.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's ID records.

Agilent Test Results Table:

Test Description	Expected Test Result	Actual Test Result
Autotune	Pass	Pass

Agilent Parts List Table:

Part Description	Part Number	Product/Model # where used	Quantity Consumed

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Agilent GC/MS Preventive Maintenance Checklist

Important Customer Web Links

How to get information on your product:

Literature Library  
Need to know more?  
Need technical support?  
Need supplies?

[www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
[www.agilent.com/chem/education](http://www.agilent.com/chem/education)  
[www.agilent.com/chem/techsupp](http://www.agilent.com/chem/techsupp)  
[www.agilent.com/chem/supplies](http://www.agilent.com/chem/supplies)

Service Engineer Comments (optional)

If there are specific points you wish to note as part of the installation or items of interest for the customer, please write in this box.

Service Completion

Service request number: 605390959 Date service completed: 13 Jun 2018  
Agilent signature: Adinek N Customer signature: \_\_\_\_\_  
Number of pages: 12

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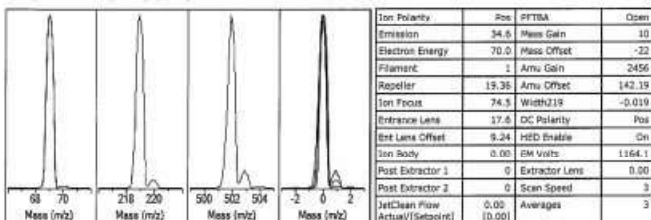
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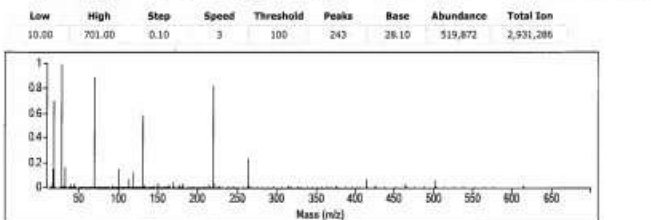
Autotune - 5977

Tune timestamp: 6/13/2022 2:20 PM (UTC+07:00)  
D:\MASSHUNTER\GCMS\1\5977\atune.u

GCMS  
US2009M037



Temperatures and Pressures			
MS Source	230 Turbo Speed	100.0	
MS Quad	150 HI Vac	1.93e-05	



Air/Water Check: H2O ~78.9% N2 ~112.8% O2 ~17.7% CO2 ~3.0% N2/H2O ~142.9%  
Column(1) Flow: 1.00 Column(2): 0.00 ml/min Interface Temp: 250

Kamp Criteria:

Ion Focus maximum: 90 volts using ion 502; Electron Multiplier Gain 106428.379  
Repeller maximum: 35 volts using ion 219; Gain Factor: 1.0643

Mass Gain Values(Scan Speed): 25(3) 29(2) 53(1) 85(0) 110(FS1) 163(FS2)

TARGET MASS:	50	69	131	219	414	502	1050
Amu Offset	142.2	142.2	142.2	142.2	142.2	142.2	142.2
Entrance Lens Offset	9.2	9.2	9.2	9.2	9.2	9.2	9.2

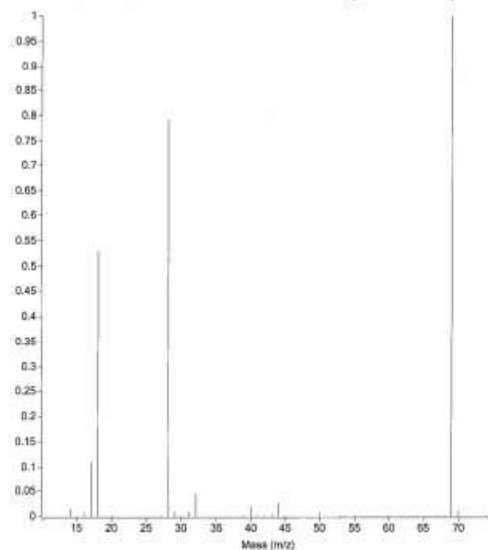
Report Created: 6/13/2022 2:20 PM (UTC+07:00)

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597x Air and water check

Instrument: GCMS  
Mon Jun 13 14:38:41 2022

D:\MASSHUNTER\GCMS\1\5977\



Current Params used: atune.u

Relative abundances:  
18/69 = 53.00 water% (counts=254656)  
28/69 = 79.22 Nitrogen% (counts=380672)  
32/69 = 4.56 Oxygen% (counts=21888)  
44/69 = 2.67 Carbon Dioxide% (counts=12840)  
28/18 = 149.48 Nitrogen/water%

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System Verification - Tune (Detector Optimization) Portion

Instrument Name : GCMS  
 DC Polarity : Positive  
 Filament :  
 Current Vacuum status :High Vacuum: 1.76E-05 Torr Turbo:100%  
 BasePeak should be 69 or 219  
 Position of mass 69 69.00 OK  
 Position of mass 219 219.00 OK  
 Position of mass 502 502.00 OK  
 Position of isotope mass 70 70.01 OK  
 Position of isotope mass 228 228.00 OK  
 Position of isotope mass 503 503.02 OK  
 Ratio of mass 70 to mass 69(0.5 - 1.6%) 1.28 OK  
 Ratio of mass 220 to mass 219(3.2 - 5.4%) 4.40 OK  
 Ratio of mass 503 to mass 502(7.9 - 12.3%) 10.13 OK  
 Ratio of 219 to 69 should be > 40% and is 95.82 OK  
 Ratio of 502 to 69 should be > 2.4% and is 6.98 OK  
 Mass 69 Precursor (<= 3%) 0.52 OK  
 Mass 219 Precursor (<= 6%) 0.47 OK  
 Mass 502 Precursor (<= 12%) 2.80 OK

SPTx Air and Water Check  
 Mon Jun 13 14:26:14 2022 Instrument: GCMS  
 D:\MASHUNTER\GCMS\1\5277\tune.u US2009H037

Testing for a leak in the system  
 Ratio of 18 to 69 (<20%) 53.08 High  
 Ratio of 28 to 69 (<10%) 306.92 High  
 Ratio of Nitrogen to Oxygen (~5:1 for air) 4 Air Leak  
 Wait 24 hours and rerun system verification.  
 If problem persists, check for an air leak  
 or for a contaminated gas supply.  
 Electron Multiplier Voltage 2164 OK

One or more specifications was out of range.  
 Please correct before continuing.

Failure of one or more tests may be caused by  
 selecting the wrong DC Polarity.  
 Please verify that the correct DC Polarity has been set  
 by removing the detector cover and checking the label  
 at the top of the EID.