



Certificate No : 22-ATM-116  
Request No : Req-2022-1333

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(LPM)	(LPM)	(LPM)	(LPM)	(LPM)
14.5	14.50	14.48	0.02	0.21
15.0	15.00	14.97	0.03	0.22
15.8	15.80	15.76	0.04	0.23
16.6	16.60	16.54	0.06	0.24
18.3	18.30	18.23	0.07	0.27

Note  
STD : Standard  
UUC : Unit Under Calibration  
Calibration media : Air  
\* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-ATM-01 Rev.00 Issue date 01/07/25

เอกสารไม่ควบคุม

Certificate of Calibration

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

Certificate No : 22-TPM-346  
Request No : Req-2022-1333  
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Air Flow meter  
Manufacturer : BGI  
Model : Delta Cal DC1  
Serial Number : 158K50  
Resolution : 0.1 °C  
ID Number : UAE.EFM.036/2561  
Range Calibration : 20 °C to 45 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 3  
Calibration Position (mm) : 45  
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 15 %RH  
Received Date : 22 July 2022  
Calibrated Date : 16 August 2022  
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT11/RTD100, SN: 08000037, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No.: QR22-0578

Traceability

This Certificate is traceable to SI Unit through Quality Roben Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By :   
Mr. Pait Mahavorn  
Calibration Engineer Supervisor  
Issue Date : 16 August 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.  
FM-708-TPM-01 Rev.01 Issue date 13/02/20

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Calibration Note  
UUC Adjustment : Not Adjust  
Certificate No : 22-TPM-346  
Request No : Req-2022-1333  
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	TEC Reading (°C)	Correction (°C)	Uncertainty (°C)
T <sub>a</sub>	20.003	20.0	0.0	0.14
	25.004	24.9	+ 0.1	0.14
	30.000	30.0	0.0	0.14
	35.004	35.1	-0.1	0.14
	40.000	40.1	-0.1	0.14
	45.003	45.2	-0.2	0.14
T <sub>T</sub>	20.003	20.0	0.0	0.14
	25.004	25.0	0.0	0.14
	30.000	30.0	0.0	0.14
	35.004	34.9	+ 0.1	0.14
	40.000	40.0	0.0	0.14
	45.003	45.0	0.0	0.14

End of Certificate

Calibrated By :   
Mr. Sirichok Jirapaksorn

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-TPM-01 Rev.01 Issue date 13/02/20

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Certificate of Calibration

Certificate No.: 22P2726  
Page : 1 of 2

Equipment : Aneroid Barometer  
Manufacturer : Baigo  
Model : -  
Serial No.: -  
ID No.: UAE.ANV.152/2550  
Condition As-Received: Used Item  
Received Date: 20 July 2022  
Calibration Date: 22 July 2022  
Reference: 2207-0584WSC  
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,  
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-P10, using " DKD-R 6-1; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP1142	1422505046	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.
- 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 Assanasee  
Issue Date : 25 July 2022

Approved Signatory :   
[ ] Phalinee Praprasop  
[ ] Sura Suwanasri  
[x] Atitaporn Panruch

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Cert. No.: 22P2728  
Page: 2 of 2

**Result of calibration:- Without adjustment**  
**Function:- Absolute Pressure Measurement**

**Range:** 960 hPa to 1030 hPa  
**Scale Interval:** 1 hPa (The Fifth Estimate)

**Increasing Pressure**

Applied Pressure (hPa)	956.27	957.40	978.69	985.58	999.85	1009.89	1029.55	1031.06
UUC* Indication (hPa)	950.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	3.73	2.54	1.11	0.44	0.15	0.11	-0.55	-1.06

**Decreasing Pressure**

Applied Pressure (hPa)	1031.19	1020.73	1009.91	999.92	985.72	979.13	967.71	956.54
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-1.19	-0.73	-0.09	-0.08	-0.28	-0.87	-2.29	-3.36

The uncertainty of measurement was  $\pm 0.30$  hPa

\* 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 1118529



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, BANGKOK 10250  
TEL. 0-2717-3160-34 FAX. 0-2719-9484



**Certificate of Calibration**

Certificate No.: 22H1557  
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE-ANV.127/2550

Condition As-Received: Used Item

Received Date: 20 July 2022

Calibration Date: 22 July 2022

Reference: 2207-0586WSC

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 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 were 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 Dumnar  
Issue Date: 03 August 2022

Approved Signatory: [Signature]  
[Signature]  
[Signature]  
[Signature]

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B 0293723



Cert. No.: 22H1587  
Page: 2 of 2

**Result of Calibration:-**

Before Adjustment				
Humidity measurement.				
Reference Temperature ( $^\circ\text{C}$ )	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement ( $\pm$ %R.H.)
25.0	40.1	38	-2.1	1.6
25.0	60.0	57	-3.0	1.8
25.0	80.0	74	-6.0	2.0

**Result of Calibration:-**

After Adjustment				
Humidity measurement.				
Reference Temperature ( $^\circ\text{C}$ )	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement ( $\pm$ %R.H.)
25.0	40.1	40	-0.1	1.6
25.0	60.0	60	0.0	1.8
25.0	80.0	77	-3.0	2.0

**Result of Calibration:-**

Function:	Temperature measurement.			
	Standard	UUC*	Uncertainty	
	<u>Temperature</u>	<u>Reading</u>	<u>Error</u>	<u>of Measurement</u>
	(°C)	(°C)	(°C)	(±°C)
	20.00	20.0	0.00	0.72
	25.04	25.0	-0.04	0.72
	30.01	30.0	-0.01	0.72
	35.04	35.0	-0.04	0.72
	39.98	40.0	0.02	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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**THAI METEOROLOGICAL DEPARTMENT**

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2864, 0-2399-9469

**Calibration Certificate**

Issued by: Calibration & Test Section: Meteorological Instruments Bureau

Date of Issue: 7 April, 2022

Certification No.: 148/22

Page: 1 of 6

Object: เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer: LSI

Type: Data Logger E-LOG 305 wind speed and wind direction DNA 827

Thermoanemometers DMA875 Barometer DOA 801

Mfg Code: Data Logger 19040405 wind speed and wind direction 19050234

Thermoanemometers 19050006 Barometer 19040218

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

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

Calibration Condition: Temperature  $25.1 ^\circ\text{C}$  Barometric Pressure 1014.1 hPa

NATIONAL STANDARD WIND TUNNEL: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241480

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629566)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER: Theodor Friedrich: Dry No.8390/94 Wet No. 8389/94

: testo, testo 645 Serial No. 02848027 : Thermoschneider No.918602

STANDARD BAROMETER: Digital Barometer Vaisala Type PTB330 No. 301320015

: Digital Barometer Vaisala Type PTB330 No. 301320001

Calibrated by: [Signature] Signed: [Signature] (Authorized Signatory)

Mr. Wacharapol Subwat Mr. Phatthana Prensut

Mechanical Engineer

เอกสารไม่ควบคุม



## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

### The Result of Calibration

Certification No. 148/22

7 April, 2022

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H <sub>2</sub> O	Vacuum inches H <sub>2</sub> O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	-
3.02	-	-	-	2.9	0.12
5.00	-	-	-	4.7	0.30
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.7	0.32
11.02	-	-	-	10.8	0.22
13.01	-	-	-	12.7	0.31
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.7	0.32
20.02	-	-	-	19.8	0.22

Wind Aloft Plotting Board	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :   
Mr. Watchapol Subwat  
Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau

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## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

### Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 2 August, 2022

Certification No. : 275/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger 20040002 wind speed and wind direction 20040162  
ID No. : No. 2/20

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.7 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 10 m/sec

Calibrated by :   
Mr. Watchapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisod Pomsat

(Authorized Signatory)  
for the Chief

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## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

### The Result of Calibration

Certification No. 275/22

2 August, 2022

Page : 2 of 2

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H <sub>2</sub> O	Vacuum inches H <sub>2</sub> O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.8	0.24
9.02	-	-	-	8.8	0.22
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.7	0.31
15.01	-	-	-	14.6	0.41
17.02	-	-	-	16.6	0.42
20.02	-	-	-	19.5	0.52

Wind Aloft Plotting Board	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :   
Mr. Watchapol Subwat  
Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau

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## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

### Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 12 July, 2022

Certification No. : 259/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger 20040005 wind speed and wind direction 20040164  
ID No. : No. 4/20

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.4 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 10 m/sec

Calibrated by :   
Mr. Watchapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisod Pomsat

(Authorized Signatory)  
for the Chief

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# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## The Result of Calibration

Certification No. 259/22

12 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H <sub>2</sub> O	inches H <sub>2</sub> O	m/sec	m/sec	m/sec
1.00	-	-	-	0.6	0.40
3.02	-	-	-	2.4	0.62
5.00	-	-	-	4.1	0.90
7.04	-	-	-	6.4	0.64
9.02	-	-	-	8.1	0.92
11.01	-	-	-	10.4	0.61
13.01	-	-	-	12.3	0.51
15.01	-	-	-	14.7	0.31
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.7	0.32

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watcharapol Subwat  
Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau

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# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 12 July, 2022

Certification No. 261/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger 20040026 wind speed and wind direction 20040177  
ID No. : No.7/20

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1004.3 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 20 - 30 m/sec

Calibrated by :

Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :  
Mr. Pisoot Promsat

(Authorized Signatory)  
for the Chief

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# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## The Result of Calibration

Certification No. 261/22

12 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H <sub>2</sub> O	inches H <sub>2</sub> O	m/sec	m/sec	m/sec
1.00	-	-	-	0.8	0.20
3.02	-	-	-	2.6	0.42
5.00	-	-	-	4.3	0.70
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.7	0.32
11.01	-	-	-	10.5	0.51
13.01	-	-	-	12.7	0.31
15.01	-	-	-	14.9	0.11
17.02	-	-	-	16.7	0.32
20.02	-	-	-	19.8	0.22

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watcharapol Subwat  
Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau

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# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 12 July, 2022

Certification No. 260/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger 20040039 wind speed and wind direction 20040180  
ID No. : No.10/20

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1004.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 20 - 30 m/sec

Calibrated by :

Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :  
Mr. Pisoot Promsat

(Authorized Signatory)  
for the Chief

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## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2884, 0-2399-6469

### The Result of Calibration

Certification No. 260/22

12 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H <sub>2</sub> O	inches H <sub>2</sub> O	m/sec	m/sec	m/sec
1.00	-	-	-	0.6	0.40
3.02	-	-	-	2.5	0.52
5.00	-	-	-	4.0	1.00
7.04	-	-	-	6.4	0.64
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.3	0.71
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.6	0.41
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.6	0.42

Wind Aloft Plotting Board	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :   
Mr. Wuttharaporn Subwat  
Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau

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## CALIBRATION LABORATORY Co., LTD.

2/10-11/14/55 Soi Prasert Manukul 20 Yaek 4, Prasert Manukul Rd., Ladphrae, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sale@cal-lab.com



### CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12392/UM12392  
CLID. NO. : 251801349  
JOB CONTROL NO. : 220221017950

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 21 February 2022

DATE OF ISSUED : 24 February 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By : Mongkol Yotsontorn  
Authorized Signatory  
24 February 2022



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

Certificate No. Q22017950  
F3-011-0401-12

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## CALIBRATION LABORATORY Co., LTD.

2/10-11/14/55 Soi Prasert Manukul 20 Yaek 4, Prasert Manukul Rd., Ladphrae, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sale@cal-lab.com



### REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12392/UM12392  
DATE OF CALIBRATION : 22 February 2022

#### ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Portable Vibration Calibrator, The Model Shop Model 9110D S/N. 11424.

#### TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
- The measurements are traceable to International System of Units (SI), through The Model Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement (EA-402 M:2013)"

Certificate No. Q22017950  
F3-011-0401-12

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## CALIBRATION LABORATORY Co., LTD.

2/10-11/14/55 Soi Prasert Manukul 20 Yaek 4, Prasert Manukul Rd., Ladphrae, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sale@cal-lab.com



### CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

#### CALIBRATION DATA

##### 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	± ( % of rdg. )
0.3	50 Hz	peak	0.300	0.301	-0.001	1.9
0.4	50 Hz		0.400	0.403	-0.003	1.9
0.5	50 Hz		0.500	0.505	-0.005	1.3
0.6	50 Hz		0.600	0.607	-0.007	1.3
0.7	50 Hz		0.700	0.708	-0.008	1.3
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.9
0.5	100 Hz		0.500	0.506	-0.006	1.3
0.6	100 Hz		0.600	0.608	-0.008	1.3
0.7	100 Hz		0.700	0.709	-0.009	1.3

##### 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
3	50 Hz	peak	3.000	3.049	-0.049	1.8
4	50 Hz		4.000	4.060	-0.060	1.8
5	50 Hz		5.000	5.073	-0.073	1.8
6	50 Hz		6.000	6.083	-0.083	1.8
7	50 Hz		7.000	7.099	-0.099	1.8
3	100 Hz	peak	3.000	3.047	-0.047	1.8
4	100 Hz		4.000	4.066	-0.066	1.8
5	100 Hz		5.000	5.078	-0.078	1.8
6	100 Hz		6.000	6.088	-0.088	1.8
7	100 Hz		7.000	7.100	-0.100	1.8

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F3-011-0401-12

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**CALIBRATION DATA**

**\*3. DISPLACEMENT RESULT**

Test point (mm) (frequency)	Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
0.03 50 Hz	peak	0.030	0.030	0.000	2.1
0.04 50 Hz		0.040	0.040	0.000	1.7
0.05 50 Hz		0.050	0.050	0.000	1.5
0.06 50 Hz		0.060	0.060	0.000	1.5
0.07 50 Hz		0.070	0.071	-0.001	1.2
0.03 100 Hz	peak	0.030	0.030	0.000	2.1
0.04 100 Hz		0.040	0.040	0.000	1.7
0.05 100 Hz		0.050	0.050	0.000	1.5
0.06 100 Hz		0.060	0.060	0.000	1.3
0.07 100 Hz		0.070	0.071	-0.001	1.2

Note: \* means Calibrations marked \* Not ANAB Accredited \* in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 38

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

### End of Certificate ###

Certificate No. Q22017950

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**CERTIFICATE OF CALIBRATION**

**FOR**

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12393/UM12393  
CLID. NO. : 251801351  
JOB CONTROL NO. : 220207012260

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10240

DATE OF RECEIVED : 07 February 2022

DATE OF ISSUED : 10 February 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer



Approved By : Mongkol Yotsontorn  
Authorized Signatory  
10 February 2022

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

Certificate No. Q22012260

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**REPORT OF CALIBRATION**

**FOR**

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12393/UM12393  
DATE OF CALIBRATION : 08 February 2022

**ENVIRONMENT CONDITIONS :**

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$

**PROCEDURE USED :**

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

**REFERENCE STANDARD USED :**

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

**TRACEABILITY :**

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
- The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

**UNCERTAINTY :**

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement (EA-4/02 M:2013)"

Certificate No. Q22012260

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**CONDITION OF CALIBRATION ITEM : GOOD**

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

**CALIBRATION DATA**

**1. ACCELERATION RESULT**

Test point (g) (frequency)	Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
0.3 50 Hz	peak	0.300	0.307	-0.007	1.9
0.4 50 Hz		0.400	0.409	-0.009	1.9
0.5 50 Hz		0.500	0.512	-0.012	1.3
0.6 50 Hz		0.600	0.615	-0.015	1.3
0.7 50 Hz		0.700	0.719	-0.019	1.3
0.3 100 Hz	peak	0.300	0.308	-0.008	1.9
0.4 100 Hz		0.400	0.410	-0.010	1.9
0.5 100 Hz		0.500	0.513	-0.013	1.3
0.6 100 Hz		0.600	0.616	-0.016	1.3
0.7 100 Hz		0.700	0.720	-0.020	1.3

**2. VELOCITY RESULT**

Test point (mm/s) (frequency)	Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
3 50 Hz	peak	3.000	3.042	-0.042	1.8
4 50 Hz		4.000	4.062	-0.062	1.8
5 50 Hz		5.000	5.070	-0.070	1.8
6 50 Hz		6.000	6.082	-0.082	1.8
7 50 Hz		7.000	7.098	-0.098	1.8
3 100 Hz	peak	3.000	3.046	-0.046	1.8
4 100 Hz		4.000	4.065	-0.065	1.8
5 100 Hz		5.000	5.072	-0.072	1.8
6 100 Hz		6.000	6.082	-0.082	1.8
7 100 Hz		7.000	7.099	-0.099	1.8

Certificate No. Q22012260

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# CALIBRATION LABORATORY Co.,LTD.

210-11,14,15 Soi Praset Manukul 29 Yaek 4, Praset Manukul Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0253-4 Fax: 02-578-2672 www.cal-lab.com E-mail: info@cal-lab.com



# CALIBRATION LABORATORY Co.,LTD.

210-11,14,15 Soi Praset Manukul 29 Yaek 4, Praset Manukul Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0253-4 Fax: 02-578-2672 www.cal-lab.com E-mail: info@cal-lab.com



## CALIBRATION DATA

### \*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.5
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.071	-0.001	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: \* means Calibrations marked "Not ANAB Accredited" in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q22012260

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## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
 MANUFACTURER : INSTANTEL  
 MODEL / TYPE : 721A2501/721A2901  
 SERIAL NO. : UM12394/UM12394  
 CLID. NO. : 251801348  
 JOB CONTROL NO. : 220118005355

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
 81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
 BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 18 January 2022

DATE OF ISSUED : 21 January 2022

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

Calibrated By : Suwit Phuanbusabong  
 Calibration Engineer



Approved By : Mongkol Votsoontorn  
 Authorized Signatory  
 21 January 2022

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

Certificate No. Q22005355

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# CALIBRATION LABORATORY Co.,LTD.

210-11,14,15 Soi Praset Manukul 29 Yaek 4, Praset Manukul Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0253-4 Fax: 02-578-2672 www.cal-lab.com E-mail: info@cal-lab.com



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
 MANUFACTURER : INSTANTEL  
 MODEL / TYPE : 721A2501/721A2901  
 SERIAL NO. : UM12394/UM12394  
 DATE OF CALIBRATION : 19 January 2022

#### ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A1J042.
- Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

#### TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
- The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2.00 which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement (EA-402 M:2013)"

Certificate No. Q22005355

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# CALIBRATION LABORATORY Co.,LTD.

210-11,14,15 Soi Praset Manukul 29 Yaek 4, Praset Manukul Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0253-4 Fax: 02-578-2672 www.cal-lab.com E-mail: info@cal-lab.com



#### CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment  
CALIBRATION DATA

#### 1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.299	+0.001	1.9
0.4	50 Hz		0.400	0.396	+0.004	1.9
0.5	50 Hz		0.500	0.495	+0.005	1.3
0.6	50 Hz		0.600	0.594	+0.006	1.3
0.7	50 Hz		0.700	0.693	+0.007	1.3
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.9
0.5	100 Hz		0.500	0.504	-0.004	1.3
0.6	100 Hz		0.600	0.607	-0.007	1.3
0.7	100 Hz		0.700	0.708	-0.008	1.3

#### 2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.041	-0.041	1.8
4	50 Hz		4.000	4.055	-0.055	1.8
5	50 Hz		5.000	5.070	-0.070	1.8
6	50 Hz		6.000	6.081	-0.081	1.8
7	50 Hz		7.000	7.093	-0.093	1.8
3	100 Hz	peak	3.000	3.031	-0.031	1.8
4	100 Hz		4.000	4.042	-0.042	1.8
5	100 Hz		5.000	5.056	-0.056	1.8
6	100 Hz		6.000	6.077	-0.077	1.8
7	100 Hz		7.000	7.083	-0.083	1.8

Certificate No. Q22005355

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CALIBRATION DATA

\*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty $\pm$ (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.049	+0.001	1.5
0.06	50 Hz		0.060	0.059	+0.001	1.3
0.07	50 Hz		0.070	0.069	+0.001	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.051	-0.001	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: \* means Calibrations marked "Not ANAB Accredited" in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 38

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

### End of Certificate ###

Certificate No. Q22095355

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12395/UM12395  
CLID. NO. : 251801350  
JOB CONTROL NO. : 220207012258

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSEK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 07 February 2022

DATE OF ISSUED : 10 February 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer



Approved By : Mongkol Yotsontorn  
Authorized Signatory  
10 February 2022

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

Certificate No. Q22012258

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM12395/UM12395  
DATE OF CALIBRATION : 08 February 2022

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0673/21, Due Date 14 May 2022.
- The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q22012258

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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty $\pm$ (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.303	-0.003	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.9
0.5	50 Hz		0.500	0.506	-0.006	1.3
0.6	50 Hz		0.600	0.606	-0.006	1.3
0.7	50 Hz		0.700	0.707	-0.007	1.3
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.506	-0.006	1.3
0.6	100 Hz		0.600	0.607	-0.007	1.3
0.7	100 Hz		0.700	0.708	-0.008	1.3

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty $\pm$ (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.033	-0.033	1.8
4	50 Hz		4.000	4.049	-0.049	1.8
5	50 Hz		5.000	5.053	-0.053	1.8
6	50 Hz		6.000	6.074	-0.074	1.8
7	50 Hz		7.000	7.082	-0.082	1.8
3	100 Hz	peak	3.000	3.036	-0.036	1.8
4	100 Hz		4.000	4.052	-0.052	1.8
5	100 Hz		5.000	5.055	-0.055	1.8
6	100 Hz		6.000	6.078	-0.078	1.8
7	100 Hz		7.000	7.089	-0.089	1.8

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### CALIBRATION DATA

#### \*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.5
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.070	0.000	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: \* means Calibrations marked \* Not ANAB Accredited \* in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q32012258

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### CERTIFICATE OF CALIBRATION

#### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14468/UM14468  
CLID. NO. : 252000051  
JOB CONTROL NO. : 220118005358

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHAMONG, BANGKOK 10260

DATE OF RECEIVED : 18 January 2022

DATE OF ISSUED : 21 January 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer



Approved By : Mongkol Votsoontorn  
Authorized Signatory  
21 January 2022

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

Certificate No. Q32005358

F3-011-04/01-12

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### REPORT OF CALIBRATION

#### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14468/UM14468  
DATE OF CALIBRATION : 19 January 2022

#### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N: 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N: 2448A11042.
- Portable Vibration Calibrator, The Modal Shop Model 9110D S/N: 11424.

#### TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
- The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2013)"

Certificate No. Q22005358

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#### CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

#### CALIBRATION DATA

##### 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.9
0.5	50 Hz		0.500	0.508	-0.008	1.3
0.6	50 Hz		0.600	0.609	-0.009	1.3
0.7	50 Hz		0.700	0.713	-0.013	1.3
0.3	100 Hz	peak	0.300	0.306	-0.006	1.9
0.4	100 Hz		0.400	0.408	-0.008	1.9
0.5	100 Hz		0.500	0.510	-0.010	1.3
0.6	100 Hz		0.600	0.612	-0.012	1.3
0.7	100 Hz		0.700	0.718	-0.018	1.3

##### 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.600	3.835	-0.035	1.8
4	50 Hz		4.000	4.050	-0.050	1.8
5	50 Hz		5.000	5.063	-0.063	1.8
6	50 Hz		6.000	6.073	-0.073	1.8
7	50 Hz		7.000	7.091	-0.091	1.8
3	100 Hz	peak	3.600	3.841	-0.041	1.8
4	100 Hz		4.000	4.053	-0.053	1.8
5	100 Hz		5.000	5.072	-0.072	1.8
6	100 Hz		6.000	6.078	-0.078	1.8
7	100 Hz		7.000	7.099	-0.099	1.8

Certificate No. Q22005358

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### CALIBRATION DATA

#### \*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.5
0.06	50 Hz		0.060	0.061	-0.001	1.3
0.07	50 Hz		0.070	0.072	-0.002	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.072	-0.002	1.2

Note: \* means Calibrations marked \* Not ANAB Accredited \* In this Certificate have been included for completeness.

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

Certificate No. Q22005358  
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### 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-373  
**Request No** : Req-2022-0840

**Unit Under Calibration Details**  
Measurement item : Acoustic Calibrator  
Manufacturer : EASON DAVIS  
Model : CAL150  
Serial Number : 6307  
ID : UAE.EFM.049/2563

**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 ±10.0 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 calibration

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 Luangart  
Service Calibration Engineer

**Approved By** :   
Mr. Pait Mathavorn  
Calibration Engineer Supervisor  
**Issue Date** : 8 June 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.  
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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 exclude 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 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok  
10260

**Certificate No** : 22-ACT-349  
**Request No** : Req-2022-0629

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LA72  
Serial Number : 0065304  
ID : UAE.EFM.115/2562  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 329356  
Preamplifier Model : PIMLA72B  
Preamplifier S/N : 054099  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 23 March 2022  
Calibration Date : 1 April 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	186273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest cal	EFA000234	14 June 2022	TIS
Audio Generator	Scantek	Scan401	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. Noppadon Luangart  
Calibration Officer

**Approved By** :   
Mr. Pait Mathavorn  
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 laboratory.  
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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.  
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Certificate No.: 22-ACT-249

Request No.: Req-2022-0629

#### 1. Indication at the calibration check frequency

EUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY  (+/- dB)	Acceptance  Limit  (+/- dB)
		Level	UUC	ERR	UUC		
FAST / A / 37-139	(dB)	(dB)	(dB)	(dB)	(dB)		
Calibrator Setting							
1000 Hz 114.00 dB	113.85	113.8	-0.05	113.8	0.05	0.20	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 25A, SN:58079

#### 2. Self-generated noise, Microphone installed

EUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
EUC Weighting	(dB)	( $\pm$ dB)
A	24.7	0.30

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

EUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
EUC Weighting	(dB)	( $\pm$ dB)
A	24.1	0.30
C	23.5	0.30
Z	27.8	0.30

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

EUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
STD Setting					
125 Hz	0.1	0.1	0.1	0.30	2.0
1000 Hz	0.0	0.0	0.0	0.00	1.0
4000 Hz	0.4	0.3	0.3	0.00	3.0
8000 Hz	-0.2	-0.3	-0.1	0.30	5.0

The results related only to the items 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-2022-0629

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

EUC 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					
63 Hz	-0.1	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	0.0	0.0	0.0		1.5
500 Hz	0.0	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
16000 Hz	-0.1	-0.1	-0.1		15.0dB

#### 6. Frequency and time weightings at 1kHz

EUC Setting	STD REF	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139					
EUC Weighting	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.1	0.1		0.2
Z	114.00	114.1	0.1		0.2

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

The results related only to the items 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-2022-0629

#### 7. Long Term Stability

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

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

EUC Setting	Anticipated REF	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / A / 37-139	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
STD dB					
120.00	120	120.0	0.0	0.3	1.1
124.00	124	124.0	0.0		1.1
128.00	128	128.0	0.0		1.1
124.00	124	124.0	0.0		1.1
118.00	118	118.0	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	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.4	0.4		1.1

The results related only to the items 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-2022-0629

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

EUC Setting	STD REF	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / A					
EUC Range	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
37-139	43.9	44.1	0.2	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

EUC Setting	STD Toneburst (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
			UUC (dB)	ERR (dB)		
A / 37-139						
EUC Time Response						
Fast	200	135.0	135.0	0.0	0.3	1.0
	2	118.0	117.8	-0.2		+1.0, -2.3
	0.25	109.0	108.8	-0.2		+1.5, -4.0
Slow	200	128.0	128.5	+0.5		1.0
	2	109.0	108.9	-0.1		+1.0, -4.0
	0.25	129.0	129.0	0.0		1.0
SEL	2	109.0	108.9	-0.1	0.2	+1.0, -2.3
	0.25	109.0	109.0	0.0		+1.5, -4.0

#### 11. Peak C Sound level

EUC Setting	Anticipated REF	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / C / 95-142					
STD Setting	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
Complete cycle	137.4	136.9	-0.50	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

The results related only to the items 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	Acceptance Limit
FAST / A / 37-139	UUC	( $\pm$ dB)	( $\pm$ dB)
STD Setting	(dB)		
Positive one-half cycle	142.9		
Negative one-half cycle	142.7		
Deviation	0.2	0.2	1.5

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	( $\pm$ dB)	( $\pm$ dB)
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviation	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 Calibration Laboratory.  
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#### Certificate of Calibration

##### Customer

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

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

##### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Class : 2  
Manufacturer : LARSON DAVIS  
Microphone Model : 375A04  
Model : LxT2  
Microphone SN : 328362  
Serial Number : 0005544  
Preamplifier Model : PRMLX2C  
ID : UAE.BFM.0012563  
Preamplifier SN : 071494  
Resolution : 0.1 dB  
Intensim Status : Used

##### Calibration Environment and Details

Temperature : 23 °C  $\pm$  2 °C  
Humidity : 50 %RH  $\pm$  20 %RH  
Barometric Pressure : 1013 MPa  $\pm$  10 MPa  
Received Date : 23 March 2022  
Calibrated Date : 1 April 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	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	198273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA00024	14 June 2022	TSI
Audio Generator	Svanick	Scan401	C31	18 October 2022	WOL 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 Laungnit  
Calibration Officer

Approved By :

Mr. Pasi Mathavon  
Calibration Engineer Supervisor  
Issue Date : 1 April 2022

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

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

#### 1. Indication at the calibration check frequency

UUC Setting	Normal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
1000 Hz 114.00 dB	113.85	113.7	-4.15	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		( $\pm$ dB)
UUC Weighting	(dB)	
A	28.1	0.30

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		( $\pm$ dB)
UUC Weighting	(dB)	
A	28.8	0.30
C	28.4	0.30
Z	22.6	0.30

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

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	( $\pm$ dB)	( $\pm$ dB)
STD Setting	(dB) (dB) (dB)		
125 Hz	0.0 0.1 0.1	0.30	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.2 0.2 0.2	0.60	3.0
8000 Hz	0.0 0.0 0.1	0.70	3.0

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

Certificate No : 22-ACT-249  
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	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	( $\pm$ dB)	( $\pm$ dB)
STD Setting	(dB) (dB) (dB)		
63 Hz	-0.2 -0.1 -0.1		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	0.2	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 -0.1		3.0
10000 Hz	-0.1 -0.1 -0.1		15.0 (N)

#### 6. Frequency and time weightings at 10Hz

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

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

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

Certificate No : 22-ACT-048  
Request No : Req-2022-0028

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ 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	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
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	98.9	-0.1	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	1.1
44.00	44	44.1	0.1	1.1
39.00	39	39.4	0.4	1.1
34.00	34	34.5	0.5	1.1

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

Certificate No : 22-ACT-048  
Request No : Req-2022-0028

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

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	( $\pm$ dB)
37-139	44.2	44.4	0.2	1.1
	114	114.0	0.0	1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Touchstart	Ref	UUC	ERR	Limit
UUC Tone Response	(ms)	(dB)	(dB)	(dB)	( $\pm$ dB)
Fast	200	135.0	135.0	0.0	1.0
	2	118.0	117.7	-0.3	+1.0, -2.5
	0.25	100.0	100.8	+0.8	+1.5, -5.0
Slow	200	126.6	126.5	-0.1	1.0
	2	100.0	100.9	+0.9	+1.0, -5.0
SEL	200	129.0	129.1	+0.1	1.0
	2	100.0	100.1	+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
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	( $\pm$ dB)
Complete cycle	137.4	136.7	-0.70	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 items calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.  
เอกสารไม่ควบคุม

Certificate No : 22-ACT-048  
Request No : Req-2022-0028

#### 12. Overload indication

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

#### 13. High Level Stability

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

End of Certificate

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

#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 22-ACT-034  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok. Request No : Req-2022-0092  
10286

##### Unit Under Calibration Details

Measurement Item : Sound Level Meter Microphone Class : 2  
Manufacturer : LARSON DAVIS Microphone Model : 275A04  
Model : LaT2 Microphone S/N : 329361  
Serial Number : 0005194 Pre-amplifier Model : PBM-LX2C  
ID : UAEJFM0312564 Pre-amplifier S/N : 073810  
Resolution : 0.1 dB Instrument Status : Used

##### Calibration Environment and Details


Temperature : 23 °C  $\pm$  2 °C  
Humidity : 30 %RH  $\pm$  20 %RH  
Barometric Pressure : 1013 hPa  $\pm$  10 hPa  
Received Date : 14 January 2022  
Calibrated Date : 21 January 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	100773	13 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Scantek	Scantek	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. Nopadol Luangn  
Calibration Officer

Approved By :   
Mr. Poch Mahavong  
Calibration Engineer Supervisor  
Issue Date : 21 January 2022

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



Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 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	ERR		
Calibrator Setting	(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 Sound Calibrator Brand SVANTER, Model SV 35A, SN:58079

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
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		
UUC Weighting	(dB)	( $\pm$ dB)
A	27.5	0.10
C	27.0	0.10
Z	31.8	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	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
STD Setting					
125 Hz	0.0	0.1	0.0	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.50	1.0
4000 Hz	0.2	0.3	0.2	0.60	3.0
8000 Hz	-0.2	-0.3	-0.2	0.70	5.0

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เอกสารไม่ควบคุม

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 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					
63 Hz	-0.2	-0.1	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	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -10%

#### 6. Frequency and time weightings at 1kHz

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

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เอกสารไม่ควบคุม

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 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		

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

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / A / 37-139					
STD dB	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
130.00	130	130.0	0.0	0.5	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	0.5	1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.8	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.3	0.3		1.1
29.00	29	29.3	0.3		1.1

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

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

UUC Setting	STD REF	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / A					
UUC Range					
37-139	42.8	43.0	0.2	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

UUC Setting	STD Toneburst (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
			UUC (dB)	ERR (dB)		
A / 37-139						
UUC Time Response						
Fast	200	135.0	135.0	0.0	0.3	1
	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	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	109.0	108.9	-0.1		1
SEL	200	129.0	129.0	0.0		1
	2	109.0	109.1	+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 REF	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)		
FAST / C / 95-142					
STD Setting	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
Complete cycle	137.4	136.8	-0.60	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

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 12. Overload indication

EUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	EUC		
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

EUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	EUC		
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 items calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovator Instrument Co., Ltd.  
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#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomrak 41, Sakhuemrak Road, Bangchak, Prakanong, Bangkok 10260  
Certificate No : 22-ACT-247  
Request No : Req-2022-0627

##### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Class : 2  
Manufacturer : LARSON DAVIS  
Microphone Model : 375A04  
Model : LxT2  
Microphone S/N : 320555  
Serial Number : 0001395  
Preamplifier Model : PPM-LAT2C  
ID : UAE-EFM-0322944  
Preamplifier S/N : 075797  
Resolution : 0.1 dB  
Intensities Status : Used

##### Calibration Environment and Details

Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
Humidity :  $50\% \pm 21\%$   
Barometric Pressure :  $1013 \text{ hPa} \pm 10 \text{ hPa}$   
Received Date : 23 March 2022  
Calibrated Date : 1 April 2022  
Calibration Procedure : In-house method CP-50-M-01 based on IEC 61672-1:2013 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	188275	15 September 2022	GRAS
Multi-frequency Calibrator	Quant	Quant-cal	EFA000234	14 June 2022	TNI
Audio Generator	Scantek	Scantek	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 Laungat  
Calibration Officer

##### Approved By :

Mr. Pait Mahavasin  
Calibration Engineer Supervisor

Issue Date : 1 April 2022

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovator Instrument Co., Ltd.  
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Certificate No : 22-ACT-247  
Request No : Req-2022-0627

#### 1. Indication at the calibration check frequency

EUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance Limit
FAST / A / 37-139		Level	EUC	ERR	EUC		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
1000 Hz (114.00 dB)	113.85	113.8	-0.05	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.19079

#### 2. Self-generated noise, Microphone installed

EUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
EUC Weighting	(dB)	( $\pm$ dB)
A	28.4	0.10

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

EUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
EUC Weighting	(dB)	( $\pm$ dB)
A	28.1	0.10
C	27.7	0.10
Z	22.0	0.10

#### 4. Acoustic signal test of frequency weightings

(Without Windscreen)

EUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z		
STD Setting	(dB) (dB) (dB)	( $\pm$ dB)	( $\pm$ dB)
125 Hz	0.0 0.1 0.1	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.4 0.5 0.5	0.60	1.0
8000 Hz	0.2 0.1 0.3	0.70	1.0

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Certificate No : 22-ACT-247  
Request No : Req-2022-0627

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

EUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	( $\pm$ dB)	( $\pm$ dB)
STD Setting			
83 Hz	-0.2 -0.1 -0.1		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	0.2	1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		1.0
8000 Hz	-0.1 -0.1 0.0		1.0
10000 Hz	-0.1 -0.1 -0.1		-1.5, -0.5

#### 6. Frequency and time weightings at 1kHz

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

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

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



Certificate No : 22-ACT-247  
Request No : Req-2022-0627

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ 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	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC		Limit
STD dB	(dB)	(dB)	(dB)	( $\pm$ dB)
139.00	139	139.0	0.0	1.3
134.00	134	134.0	0.0	1.3
129.00	129	129.0	0.0	1.3
124.00	124	124.0	0.0	1.3
119.00	119	119.0	0.0	1.3
114.00	114	114.0	0.0	1.3
109.00	109	109.0	0.0	1.3
104.00	104	104.0	0.0	1.3
99.00	99	99.0	0.0	1.3
94.00	94	94.0	0.0	1.3
89.00	89	89.0	0.0	1.3
84.00	84	84.0	0.0	1.3
79.00	79	79.0	0.0	1.3
74.00	74	74.0	0.0	1.3
69.00	69	69.0	0.0	1.3
64.00	64	64.0	0.0	1.3
59.00	59	59.0	0.0	1.3
54.00	54	54.0	0.0	1.3
49.00	49	49.0	0.0	1.3
44.00	44	44.1	0.1	1.3
39.00	39	39.3	0.3	1.3
34.00	34	34.4	0.4	1.3

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.  
เอกสารไม่ควบคุม

Certificate No : 22-ACT-247  
Request No : Req-2022-0627

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

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC		Limit
UUC Range	(dB)	(dB)	(dB)	( $\pm$ dB)
37-139	43.4	43.3	0.1	1.3
	114	114.0	0.0	1.3

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC		Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	( $\pm$ dB)
Fast	200	135.0	134.9	-0.1	1.0
	2	118.0	117.8	-0.2	+1.0, -2.5
	0.25	109.0	108.7	-0.3	+1.0, -5.0
Slow	200	128.6	128.4	-0.2	1.0
	2	109.0	108.8	-0.2	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1.0
	2	109.0	109.1	+0.1	+1.0, -2.5
	0.25	109.0	99.9	-0.1	+1.5, -5.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC		Limit
STD Setting	(dB)	(dB)	(dB)	( $\pm$ dB)
Complete cycle	137.8	136.8	-0.40	2.0
Positive half cycle	136.4	136.2	-0.20	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.  
เอกสารไม่ควบคุม

Certificate No : 22-ACT-247  
Request No : Req-2022-0627

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Positive one-half cycle	142.2		
Negative one-half cycle	142.2		
Deviant	0.0	0.2	1.5

#### 13. High Level Stability

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

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomak 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 : LAT2  
Serial Number : 0005396  
ID : UAE.EFM.033-2564  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 329350  
Preamplifier Model : PRMLaT2C  
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 :  $1013 \text{ kPa} \pm 10 \text{ kPa}$   
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	EFA990234	14 June 2022	TSI
Audio Generator	Svaztek	Svan-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. Noppadon Luangrat  
Calibration Officer

Approved By :   
Mr. Pachi Malhavorn  
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.

TH-708-SLM-01 Rev.3 Issue date 01/07/18

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	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR		Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	9.29	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	27.8	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	27.8	0.10
C	27.3	0.10
Z	33.3	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
125 Hz	0.1	0.1	0.2	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.6	0.5	0.6	0.60	3.0
8000 Hz	0.1	0.0	0.2	0.70	5.0

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-709-02.34-01 Rev.0 Issue date 01/07/21

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	Acceptance
FAST / 37-139	A (dB)	C (dB)	Z (dB)	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± 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		1.5
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		5.0
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

#### 6. Frequency and time weightings at 1kHz

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

FSM-709-02.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

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

#### 7. Long Term Stability

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

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

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	(± dB)	Limit
STD dB	(dB)	(dB)	(dB)		(± dB)
139.00	139	139.0	0.0	0.3	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	48.9	-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.

FSM-709-02.34-01 Rev.0 Issue date 01/07/21

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

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

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
37-139	43.2	42.8	-0.4	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(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	108.9	-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
FAST / C / 95-142	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	137.4	136.7	-0.70	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

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-709-02.34-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม



Certificate No : 22-ACT-185  
Request No : Req-2022-0229

## 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± 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
FAST / A / 37-139	UUC		Limit
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. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Form-08-01,34-01 Rev-03 Issue date 01/07/21

เอกสารไม่ควบคุม

Calibration Certificate ID  
TH2058-087-040722-ACC-TH

**METTLER TOLEDO**

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Laxalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2722 3082  
MT-TH.ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

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

### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing instrument  
Model: AB204-S Asset Number: UAE.AIR.018/2550  
Serial No.: 1128312528 Terminal Model: N/A  
Building: N/A Terminal Serial No.: N/A  
Floor: 2 Terminal Asset No.: N/A  
Room: Balance Room 2 (206)

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

### Procedure

Calibration Guideline: EURAMET cg-16 v. 4.0 (11/2015)  
METTLER TOLEDO Work Instruction: CP/W002/20  
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/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-16 (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: 21.4 °C	Start: 56.1 % End: 63.2 %

As Found Calibration Date: 07-Apr-2022 Calibration:   
As Left Calibration Date: N/A  
Issue Date: 08-Apr-2022 Approved Signatory:   
☒ Kassakorn Tassanachatsakul  
☐ Santi Jitroyon  
☐ Burisat Sukkate

Software Version: 1.23.0.208  
Report Version: 2.15.13  
Form Number: F103C

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Calibration Certificate ID  
TH2058-087-040722-ACC-TH

**METTLER TOLEDO** Service

## 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	99.9999 g	N/A
10	100.0000 g	N/A
Standard Deviation	0.00006 g	N/A



The "d" 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 "d" in the graph represents the readability of the range/interval in which the test was performed.

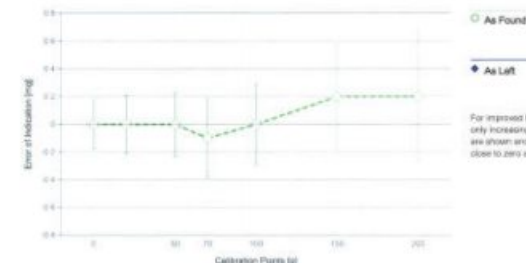
Calibration Certificate ID  
TH2058-087-040722-ACC-TH

**METTLER TOLEDO** Service

## Error of Indication

### As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.18 mg	2
2	0.1000 g	0.1000 g	0.0000 g	0.18 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.18 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.18 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	30.0000 g	30.0000 g	0.0000 g	0.23 mg	2
8	70.0001 g	70.0000 g	-0.0001 g	0.28 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.29 mg	2
10	150.0000 g	150.0002 g	0.0002 g	0.40 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.48 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-16. 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: C208541631 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

Software Version: 1.23.0.208  
Report Version: 2.15.13  
Form Number: F103C

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Software Version: 1.23.0.208  
Report Version: 2.15.13  
Form Number: F103C

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## Remarks

Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory  
Test weight by Filter 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:  $3.0 \cdot 10^{-4} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use:  $3 K$

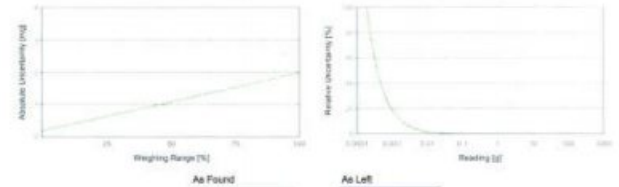
### Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.19 \text{ mg} + 0.00817 \text{ mg/g} \cdot R$	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	0.19 mg	0.86%	N/A	N/A
0.2200 g	0.19 mg	0.087%	N/A	N/A
2.2000 g	0.21 mg	0.0095%	N/A	N/A
22.0000 g	0.37 mg	0.0017%	N/A	N/A
220.0000 g	2.0 mg	0.00090%	N/A	N/A



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เอกสารไม่ควบคุม

Mettler-Toledo (Thailand) Ltd.  
848/4 - 848/5 Lualaba Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2720 5362  
MT-TH.ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak  
City: Ploea Khlong  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number:

### Weighing Device

Manufacturer: Mettler Toledo  
Model: AB204-SFACT  
Serial No.: 8108115858  
Building: N/A  
Floor: 2  
Room: Balance Room 2 (206)  
Instrument Type: Weighing Instrument  
Asset Number: UAE.AIR.0162555  
Terminal Model: N/A  
Terminal Serial No.: N/A  
Terminal Asset No.: N/A

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

### Procedure

Calibration Guideline: EURAMET cg-16 v. 4.0 (11/2013)  
Mettler-Toledo Work Instruction: CPW002/20  
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: 56.0 % End: 51.9 %
As Left	Start: 22.3 °C End: 22.4 °C	Start: 48.2 % End: 55.8 %

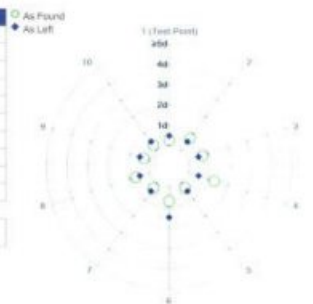
As Found Calibration Date: 07-Apr-2022  
As Left Calibration Date: 07-Apr-2022  
Issue Date: 08-Apr-2022  
Calibration:   
Approved Signatory:   
☒ Kassakorn Tassanasachakul  
☐ Sere Jitniyom  
☐ Surachet Sukkate

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## 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



The "10" 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	100.0000 g
Maximum Deviation	0.0002 g	0.0002 g



The "10" in the graph represents the readability of the range/interval in which the test was performed.

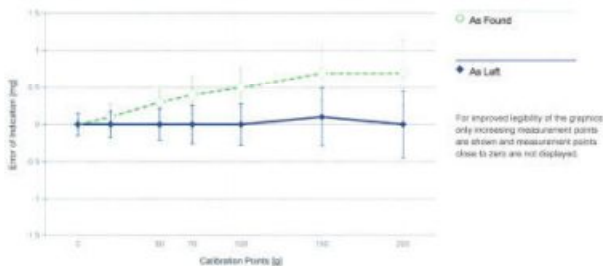
เอกสารไม่ควบคุม



Error of Indication

Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.15 mg	2
2	0.1000 g	0.1001 g	0.16 mg	2
3	1.0000 g	0.9999 g	0.16 mg	2
4	5.0000 g	5.0000 g	0.16 mg	2
5	10.0000 g	10.0001 g	0.17 mg	2
6	20.0000 g	20.0001 g	0.18 mg	2
7	50.0000 g	50.0003 g	0.26 mg	2
8	70.0001 g	70.0005 g	0.26 mg	2
9	100.0000 g	100.0005 g	0.27 mg	2
10	150.0000 g	150.0007 g	0.38 mg	2
11	200.0001 g	200.0008 g	0.44 mg	2

Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.15 mg	2
2	0.1000 g	0.1000 g	0.16 mg	2
3	1.0000 g	0.9999 g	0.17 mg	2
4	5.0000 g	5.0000 g	0.17 mg	2
5	10.0000 g	10.0000 g	0.17 mg	2
6	20.0000 g	20.0000 g	0.18 mg	2
7	50.0000 g	50.0000 g	0.21 mg	2
8	70.0001 g	70.0001 g	0.26 mg	2
9	100.0000 g	100.0000 g	0.26 mg	2
10	150.0000 g	150.0001 g	0.39 mg	2
11	200.0001 g	200.0001 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  $k=2$  which can be larger than 2 according to EURAMET cg-18. The value of the measurant 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.

เอกสารไม่ควบคุม

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:	C208541631	Calibration Due Date:	14-Aug-2023
Thermo Hygrometer			
Equipment No.:	RN181	Date of Issue:	14-Jun-2021
Certificate Number:	21H1226	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 Filter pen: 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.

เอกสารไม่ควบคุม

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:  $2.5 \cdot 10^{-4} / K$

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

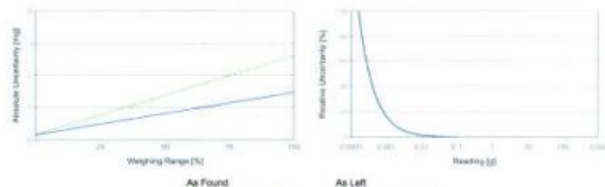
Uncertainty of Uncertainty Equation

Range	As Found	As Left
g		
1	0.0001 g	220 g
	$U_1 = 0.16 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$	$U_1 = 0.16 \text{ mg} + 0.00932 \text{ mg/g} \cdot R$

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%
0.2200 g	0.16 mg	0.074%
2.2000 g	0.18 mg	0.0084%
22.0000 g	0.40 mg	0.0018%
220.0000 g	2.8 mg	0.0012%



เอกสารไม่ควบคุม

Mettler-Toledo (Thailand) Ltd.  
848/4 - 848/5 Laxsue Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 3362  
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

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

Weighing Device

Manufacturer:	Mettler Toledo	Instrument Type:	Weighing Instrument
Model:	KPB	Asset Number:	UAE.AIR.0192550
Serial No.:	8322373893	Terminal Model:	PAT
Building:	N/A	Terminal Serial No.:	8322373893
Floor:	2	Terminal Asset No.:	N/A
Room:	Balance Room 2 (206)		

Range	Max. Capacity	Repeatability (g)
1	0.1 g	0.00001 g

Procedure

Calibration Guideline:	EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction:	CP/WO2/20

This calibration certificate contains measurements for As Found and As Left calibrations.  
The sensitivity/linearity 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: 53.0 %
As Left	Start: 22.6 °C End: 22.9 °C	Start: 52.0 % End: 53.5 %

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

Kassakorn Tassachachetkul  
Santi Jitvijon  
Surachet Sukkate

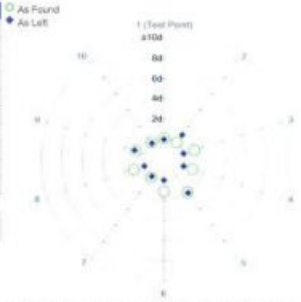
เอกสารไม่ควบคุม

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	2.000006 g	2.000008 g
5	2.000005 g	2.000008 g
6	2.000008 g	2.000008 g
7	2.000007 g	2.000008 g
8	2.000008 g	2.000008 g
9	2.000006 g	2.000009 g
10	2.000007 g	2.000008 g
Standard Deviation	0.0000010 g	0.0000008 g



The "d" 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: 2 g

Position	As Found	As Left
1	2.000008 g	2.000008 g
2	2.000007 g	2.000007 g
3	2.000008 g	2.000009 g
4	2.000011 g	2.000008 g
5	2.000002 g	2.000007 g
Maximum Deviation	0.000008 g	0.000001 g



The "d" in the graph represents the readability of the range/interval in which the test was performed.

เอกสารไม่ควบคุม

Error of Indication

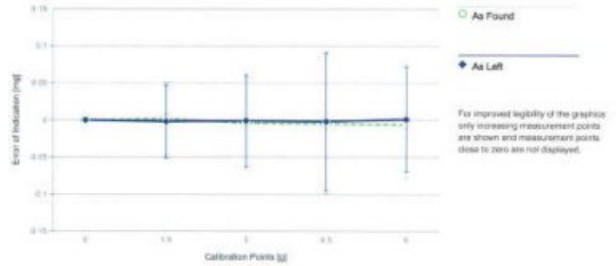
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.000000 g	0.000000 g	0.000000 g	0.0054 mg	2
2	0.010004 g	0.010008 g	0.000001 g	0.0074 mg	2
3*	0.050005 g	0.050003 g	-0.000002 g	0.011 mg	2
4*	0.100007 g	0.100007 g	0.000000 g	0.015 mg	2
5	0.150012 g	0.150011 g	-0.000001 g	0.025 mg	2
6	0.170013 g	0.170011 g	-0.000002 g	0.034 mg	2
7*	0.200011 g	0.200008 g	-0.000003 g	0.018 mg	2
8	1.500023 g	1.500025 g	0.000002 g	0.049 mg	2
9	3.000021 g	3.000017 g	-0.000004 g	0.062 mg	2
10	4.500031 g	4.500026 g	-0.000005 g	0.094 mg	2
11	6.000026 g	6.000020 g	-0.000006 g	0.072 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.000000 g	0.000000 g	0.000000 g	0.0054 mg	2
2	0.010004 g	0.010008 g	0.000001 g	0.0073 mg	2
3*	0.050005 g	0.050005 g	0.000000 g	0.011 mg	2
4*	0.100007 g	0.100007 g	0.000000 g	0.015 mg	2
5	0.150012 g	0.150011 g	-0.000001 g	0.025 mg	2
6	0.170013 g	0.170013 g	0.000000 g	0.034 mg	2
7*	0.200011 g	0.200010 g	-0.000001 g	0.018 mg	2
8	1.500023 g	1.500021 g	-0.000002 g	0.049 mg	2
9	3.000021 g	3.000020 g	-0.000001 g	0.062 mg	2
10	4.500031 g	4.500026 g	-0.000005 g	0.083 mg	2
11	6.000026 g	6.000027 g	0.000001 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 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.

เอกสารไม่ควบคุม

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 S2

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

Thermo Hygrometer

Equipment No.:	BN161	Date of Issue:	14-Jun-2021
Certificate Number:	21m1238	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 = 0.050004 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.

เอกสารไม่ควบคุม

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:	$1.8 \cdot 10^{-6} / K$
Temperature range on site for the evaluation of the measurement uncertainty in use:	3 K

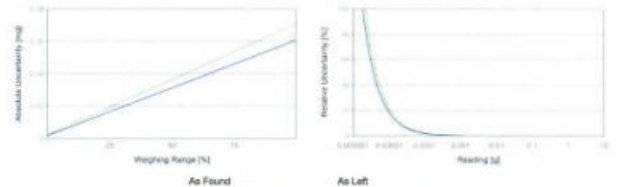
Linearization of Uncertainty Equation

	Range	Max	As Found	As Left
1	0.000001 g	6.1 g	$U_1 = 0.0021 \text{ mg} + 0.0113 \text{ mg/g} \cdot R$	$U_1 = 0.0018 \text{ mg} + 0.0096 \text{ mg/g} \cdot R$

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	
0.000010 g	0.0021 mg	0.35%	0.0018 mg	0.30%
0.006100 g	0.0022 mg	0.33%	0.0019 mg	0.30%
0.061000 g	0.0028 mg	0.0046%	0.0024 mg	0.0039%
0.610000 g	0.0090 mg	0.0015%	0.0077 mg	0.0013%
6.100000 g	0.071 mg	0.0012%	0.061 mg	0.0010%



เอกสารไม่ควบคุม



รายการใบรับรองสอบเทียบ/พวงสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำผิวดิน น้ำใต้ดิน และน้ำทิ้ง

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment									
20	COO Reactor (Heating Block)	Chemical Oxygen Demand	Hanna	H839800-02 / H0185004	Technology Promotion Association (Thailand-Japan)	HT-2209-0184	1 Mar 22	1 Mar 23	-
21	Digestor Unit	Total Kjeldahl Nitrogen (TKN)	FOSS	2220auto / 91794469	National Food Institute, Ministry of Industry, Thailand	220234-001-01	4 Apr 22	3 Apr 23	-
22	Distillation Unit (Kjeldahl Method)	Ammonia-Nitrogen	FOSS	KT8100 / 91889952	FOSS South East Asia	6423	25 Jul 22	24 Jul 23	-
23	Gas Chromatography (GC)	Total Kjeldahl Nitrogen (TKN) Organochlorine Pesticides, 2,4-D, Benz(a) Pyrene,	Agilent Technologies	System BXC11021007 7890 / CH11021007	Agilent Technologies (Thailand) Co.,Ltd.	Certificate of System Qualification GC-QQ	11 Feb 22	10 Feb 23	-
24	Gas Chromatography (GC)	PCBs, Polychlorophenol, Atrazine	Agilent Technologies	System BXC113113001 7890 / CH13113001	Agilent Technologies (Thailand) Co.,Ltd.	Certificate of System Qualification GC-QQ	22 Apr 22	21 Apr 23	-
25	Gas Chromatography / Mass Spectrometry (GC-MS)	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Styrene, 1,1-Dichloroethylene, Toluene, cis-1,2-Dichlorocyclohexene, trans-1,2-Dichlorocyclohexene, Dichloromethane, Total Xylenes, Trichloroethylene, Ethylbenzene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane	Agilent Technologies	System ID: US209940317 8890 (G5464) / CH209940317 99779 / US209940317	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	13 Jun 22	12 Jun 23	-

รายการใบรับรองสอบเทียบ/พวงสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำผิวดิน น้ำใต้ดิน และน้ำทิ้ง

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment									
26	Turbidity Meter	Turbidity	Oakton	T100R / 1120501017	Technology Promotion Association (Thailand-Japan)	22CH1184	5 Sep 22	4 Sep 23	-
Due Date of calibration* : Based on the annual calibration plan. At least 1 time per year.									

รายการใบรับรองสอบเทียบ/พวงสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำผิวดิน น้ำใต้ดิน และน้ำทิ้ง

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment									
1	pH Meter	pH Temperature	Mettler-Toledo	Sewen Easy S20 / 1231525212	National Food Institute, Ministry of Industry, Thailand	2202093-001-01	16 Mar 22	15 Mar 23	-
2	pH Meter		Hanna	HQ20A-02 / C0091107	National Food Institute, Ministry of Industry, Thailand	220313-001-01	8 Jun 22	7 Jun 23	-
3	Conductivity Meter	Electrical Conductivity	SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24220084	22 Mar 22	21 Mar 23	-
4	Analytical Balance (Repeatability 0.01 mg)	Total Solids Total Dissolved Solids	Mettler-Toledo	XS2055090 / C009071872	Technology Promotion Association (Thailand-Japan)	22M0210	26 Apr 22	25 Apr 23	-
5	Red Air Oven	Total Suspended Solids	Mettler	UF55 / B216.1566	Technology Promotion Association (Thailand-Japan)	22TM1490	19 Oct 22	18 Oct 23	-
6	BOD Incubator	Biochemical Oxygen Demand	Aeco	UC41320 / (UAE)AB.0157556.1	Technology Promotion Association (Thailand-Japan)	22TM090	17 Feb 22	16 Feb 23	-
7	BOD Incubator		Aeco	Uth1320 / 1129261010	Technology Promotion Association (Thailand-Japan)	22TM395	7 Apr 22	6 Apr 23	-
8	Analytical Balance (Repeatability 0.1 mg)	fat Oil And Grease	Mettler-Toledo	AB2055FACT / 1129261010	National Food Institute, Ministry of Industry, Thailand	220312-001-01	1 Jun 22	31 May 23	-
9	Incubator	Total Coliform Bacteria Faecal Coliform Bacteria	Mettler	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	22TM563	7 Apr 22	6 Apr 23	-
10	Incubator		Mettler	IPP 260 / V618.0033	Technology Promotion Association (Thailand-Japan)	22TM593	3 May 22	2 May 23	-

รายการใบรับรองสอบเทียบ/พวงสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำผิวดิน น้ำใต้ดิน และน้ำทิ้ง

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment									
11	Water Bath		Mettler	VME 14 / L-51.1407	Technology Promotion Association (Thailand-Japan)	22TM565	7 Apr 22	6 Apr 23	-
12	Water Bath	Total Coliform Bacteria Faecal Coliform Bacteria	Mettler	VME 14 / L-516.0606	Technology Promotion Association (Thailand-Japan)	22TM333	17 Feb 22	16 Feb 23	-
13	Analytical Balance		Mettler-Toledo	MS9035 / B0070110311	Mettler-Toledo (Thailand) Ltd.	40584-094-040724-CC-	7 Apr 22	6 Apr 23	-
14	Auto Cooker		ALP	CL-400 / 802664	Technology Promotion Association (Thailand-Japan)	22TM899	17 Feb 22	16 Feb 23	-
15	Atomic Absorption Spectrophotometer (AAS)	Iron, Titanium, Arsenic, Cadmium, Manganese, Chromium, Copper, Barium, Lead, Mercury, Nickel, Selenium, Chromium Trivalent, Chromium Hexavalent, Zinc	Agilent Technologies	System DSG8432A AAS0505 / W113160001	Thailand Institute Of Science And Technological Research (ITSTR)	NTC-ACT. No. 486465	7 Mar 22	6 Mar 23	-
16	Inductively Coupled Plasma (ICP)	Barium, Lead, Mercury, Nickel, Selenium, Chromium Trivalent, Chromium Hexavalent, Zinc	Agilent Technologies	System DSG8015A G8015A4 / W119330001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	30 Nov 22	29 Nov 23	-
17	UV-VIS Spectrophotometer	Phosphate, Ammonia-Nitrogen Sulphate, Cyanide	Agilent Technologies	Carry60 G6660A / W119410009	DGE Services Co.,Ltd.	SP92-016	31 May 22	30 May 23	-
18	UV-VIS Spectrophotometer	Nitrate Nitrogen, Phenols, Colour	Hitech	U-5900 / 2021-0464	DGE Services Co.,Ltd.	SP922-007	20 Jan 22	19 Jan 23	-
19	UV-VIS Spectrophotometer	Chromium Hexavalent, Total Nitrogen Chemical Oxygen Demand Formaldehyde, Cyanide As HCN	Hitech	U-5900 / 21E224009	DGE Services Co.,Ltd.	SP922-008	20 Jan 22	19 Jan 23	-

## Calibration Certificate

Certificate No.: 2202093-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomek 41, Sukhumvit Road,  
Bangchack, Prakhonong, 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 Somak Specialist Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory  
Date of Issue: 21 March 2022 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 recognised 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: 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 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature: ( 23.0 ± 1.5 ) °C Relative Humidity: ( 48.5 ± 5 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

1. Calibration Method				
In house method: W-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM).				
2. Reference Standards : Certified Reference Material				
Substances	Serial ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2759507	Fluke	SCL-21P-0667	24 June 2022
2.2 Digital Thermometer	2759507	Fluke	CC-640866-01	30 October 2022
2.3 Thermo-Hygro Meter	20040101005056	PONPE	QR21-2197	18 November 2022
Certified Reference Material				
Substances	Serial ID No.	Manufacturer	Certificate No.	Due Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	786012	CPAchem	PH218.L5	21 November 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	786013	CPAchem	PH217.L5	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	786015	CPAchem	PH209.L5	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	786040	CPAchem	PH107.L5	8 November 2022
3. This calibration is traceable to The International System of Unit (SI Unit)				
3.1 Instruments No.2.1	through	NIG-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0075		
3.2 Instruments No.2.2	through	NIG-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0061		
3.3 Instruments No.2.3	through	NIG-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0292		
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method named cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025		
3.5 Certified Reference Material No. 2.7	traceable to	BIM Refs H-7 Leds 30.04.2020, BIM Refs H-6 Leds 28.05.2020, BIM Refs H-8 Leds 30.04.2020, BIM Refs H-10 Leds 28.05.2020, The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025		

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.

F-CS-012 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 Page 3 of 5

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	295.511	296	2.00	0.58	2.00
4	177.442	178	4.00	0.58	2.00
6	59.159	59	6.00	0.58	2.00
7	-0.005	0	7.00	0.58	2.00
8	-89.159	-89	8.00	0.58	2.00
10	-177.463	-177	10.00	0.58	2.00
12	-295.812	-296	12.00	0.58	2.00
14	-414.119	-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  
Model: InLab Solids  
Serial No.: 9453943  
Type: Combined Electrode  
ID No.: N/A

Performance of Electrode system (Three Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	172	98.1	0.0071	2.00
6.866	6.87	6	-	0.0074	2.00
10.015	10.01	-175	97.4	0.0090	2.00
6.903	6.98	-3	-	0.0092	2.00

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

เอกสารไม่ควบคุม

## Calibration Report

Certificate No.: 2202093-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C  
Model: SevenEasy pH  
Serial No.: 1230525212  
ID No.: UAE.WAS.003/2553  
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 ).

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-7 088164	24-Jun-23	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : Low Temperature Bath (ISOCAL-E), Model: Europe-6 Plus Basic, SN: 3410922

- 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.:** 2203135-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C **Model:** SevenEasy pH  
**Serial No.:** 123052512 **ID No.:** UAE-WAS-0032503  
**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:**  
- This 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: 3.5 mm, Length: 130 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

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 —

F-CS-012 Revision: 01 Date: 14-12-61

เอกสารไม่ควบคุม

## Calibration Certificate

**Certificate No.:** 2203135-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udumuk 41, Sukhumvit Road, Bangkok, Prakhonong, Bangkok 10260

Page 1 of 5

**Equipment:** pH Meter  
**Manufacturer:** HANNA INSTRUMENTS  
**Model:** HI2020-02  
**Serial No.:** C0851107  
**ID No.:** UAE.WAO.0052557  
**Order No.:** 2203135  
**Operation No.:** 2203135-001  
**Date of Receipt:** 7 June 2022  
**Date of Calibration:** 8 June 2022

**Calibrated by:** Mr.Manas Someak Specialist  
**Approved by:**  (Mr.Pheraphot Tuanjit)  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
**Date of Issue:** 13 June 2022

The uncertainty 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 capability to recognize 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-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

## Calibration Report

**Certificate No.:** 2203135-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH | 0.1 mV  
**Manufacturer:** HANNA INSTRUMENTS **Model:** HI2020-02  
**Serial No.:** C0851107 **Type:** Bench top  
**ID No.:** UAE.WAO.0052557  
**Date of Calibration:** 8 June 2022 **Page 2 of 5**

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature: ( 23.5 ± 1.0 ) °C Relative Humidity: ( 53 ± 6 ) %  
**Condition of Equipment:** Good Condition  
**Condition of this Results of Calibration:**

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

2. Reference Standards / Certified Reference Material

Instrument	Serial / ID No.	Manufacturer	Certificate No.	Exp. Date
2.1 DC Voltage Calibrator	2790007	Fuke	SC-21F-6687	24 June 2022
2.2 Digital Thermometer	2790007	Fuke	CC-44089-01	30 October 2022
2.3 Thermo-Hygro Meter	NF18TH00518	PONPE	QR22-0351	18 February 2023

Certified Reference Material	Lot No.	Manufacturer	Ref. N	Expiry Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	805203	CPAchem	PH216.LS	21 April 2024
2.5 pH buffer 6.865 (Primary pH buffer Solution)	805204	CPAchem	PH217.LS	21 April 2024
2.6 pH buffer 10.01 (Primary pH buffer Solution)	805205	CPAchem	PH220.LS	21 April 2023
2.7 pH buffer 7.00 (Standard pH buffer Solution)	805206	CPAchem	PH2107.LS	21 April 2023

3. This certification is traceable to The International System of Unit (SI Unit)  
3.1 Instruments No.2.1 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0075  
3.2 Instruments No.2.2 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.3 Instruments No.2.3 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0292  
3.4 Certified Reference Material No. 2.4 to 2.6: traceable to Primary measurement method: Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
3.5 Certified Reference Material No.2.7: traceable to BSM Refs H-27 Lot# 04.06.2021, BSM Refs H-28 Lot# 28.06.2021, BSM Refs H-27 Lot# 04.06.2021, BSM Refs H-25 Lot# 28.05.2021, the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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.

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

## Calibration Report

**Certificate No.:** 2203135-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH | 0.1 mV  
**Manufacturer:** HANNA INSTRUMENTS **Model:** HI2020-02  
**Serial No.:** C0851107 **Type:** Bench top  
**ID No.:** UAE.WAO.0052557  
**Date of Calibration:** 8 June 2022 **Page 3 of 5**

**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	-415.9	0.00	0.063	2.00
2	-295.811	-297.5	2.00	0.063	2.00
4	-177.462	-179.1	4.00	0.063	2.00
6	-59.108	-60.8	6.00	0.063	2.00
7	-0.201	1.6	7.00	0.063	2.00
8	-59.108	-57.5	8.00	0.063	2.00
10	-177.463	-175.8	10.00	0.063	2.00
12	-295.812	-294.2	12.00	0.063	2.00
14	-414.118	-412.5	14.00	0.063	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)  
**Equipment:** pH Electrode **Type:** Combined Electrode  
**Manufacturer:** HANNA INSTRUMENTS **Model:** HI11310  
**Serial No.:** 678743 **ID No.:** N/A  
**Performance of Electrode system:** (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value (25 °C [pH])	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	168.8	98.7	0.0071	2.00
6.865	6.87	6.2	-	0.0075	2.00
10.008	10.01	-174.0	97.0	0.0087	2.00
6.865	6.99	-2.0	-	0.0083	2.00

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

## Calibration Report

**Certificate No.:** 2203135-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C **Model:** H2020-02  
**Serial No.:** C0051107 **ID No.:** UAE-WAQ-005/2957  
**Manufacturer:** HANNA INSTRUMENTS  
**Date of Calibration:** 8 June 2022 **Page 4 of 5**

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature ( 23.5 ± 1.0 ) °C  
 Relative Humidity ( 55 ± 3 ) %

### Condition of this results of Calibration:

1. Calibration Method :
  - In house method: W-T025 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	1523	2118154	PSL-T 085184	24-Jun-22	TSTR
Platinum Resistance Thermometer (PRT)	5827A	877332			

Support Equipment: - Low Temperature Bath (SOCAL-6), Model: Europe-6 Plus Basic, S/N: 3415922

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 ☐ Without adjustment ☐ After adjustment

7. Result of Calibration: ☒ X ☐ Without adjustment ☐ After adjustment

F-C5-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

2008 Soi 26, Anurach Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
 Tel: +66(0) 2442 8500 Fax: +66(0) 2442 8505  
 nfi.co.th

## Calibration Report

**Certificate No.:** 2203135-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C **Model:** H2020-02  
**Serial No.:** C0051107 **ID No.:** UAE-WAQ-005/2957  
**Manufacturer:** HANNA INSTRUMENTS  
**Date of Calibration:** 8 June 2022 **Page 5 of 5**

**Calibration point:** 15.0, 20.0 and 25.0 °C  
**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.  
 - Description of probe, model: H11310 SN: 78743  
 Dimension of probe: Diameter 12 mm, Length: 120 mm.  
 Sheath material: Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.099
20.1	20.002	-0.1	0.099
25.2	25.002	-0.2	0.099

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 -----  
 F-C5-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

2008 Soi 26, Anurach Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
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SPC Calibration Center

**SERT**  
 Part of DKSH Group

## Certificate of Calibration

**Equipment:** CONDUCTIVITY METER  
**Model:** Lab655  
**Serial No. (or ID.):** 16300356  
**Manufacturer:** SI Analytics  
**Electrode Serial No.:** 16070087  
**Condition:** In Condition  
**Certificate No.:** C24220084  
**Issued Date:** 22 March 2022  
**Job No.:** KSPR2203267  
**Page:** 1 of 2  
**Model:** LF413T **Brand:** SI Analytics

**Customer:** United Analyst and Engineering Consultant Company Limited  
 3 Soi Udomsuk 41 Sukhumvit Road,  
 Bangkok, Prakanong, Bangkok 10260 Thailand

**Environment Condition:** Temperature 23 °C ± 2 °C  
 Humidity 50 %RH ± 15 %RH

**Calibration Place:** Environment Laboratory, SPC RT Co., Ltd.  
 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,  
 Bangkok, Prakanong, Bangkok 10260 Thailand

**Calibration By:** Mr. Wasan Nuchnabee  
**Calibration Date:** 22 March 2022  
**The Method used:** In house method, SPCC-WI-49, base on ASTM D 1125-14 and D 5391-14  
**Traceability:** This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 794135, 794136, 772624

Certificate No.: C24220084 Page: 2 of 2

### Calibration Results:

#### Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
25.000 µS/cm	25.9 µS/cm	-0.900 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1444 µS/cm	-31.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.9 mS/cm	3.40 mS/cm	2.00	0.66 mS/cm

#### After Adjustment : at 1413 µS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
25.000 µS/cm	25.0 µS/cm	0.000 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.2 mS/cm	4.10 mS/cm	2.00	0.66 mS/cm

The End of Certificate

**(Mr. Wasan Nuchnabee)**  
 Person in charge

**SERT**  
 บริษัท เอสพีซี อาร์ที จำกัด  
 SPC RT Co., Ltd.

**(Mr. Dumrong Boonsopon)**  
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
 The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
 These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or measured. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

เอกสารไม่ควบคุม

SPCC-FM-C24-06: 23 Nov 2020

เอกสารไม่ควบคุม

SPCC-FM-C24-06: 23 Nov 2020



## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2203267

ชนิดเครื่องมือ: CONDUCTIVITY METER

รุ่น: Lab955

หมายเลขเครื่อง: 16300356

ตรวจสอบ (รับ)	ตรวจสอบ (ส่ง)	หมายเหตุ
22 Mar 2022	22 Mar 2022	
ปกติ	ปกติ	
ไม่ปกติ	ไม่ปกติ	
<b>General</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. ความสมบูรณ์เครื่อง
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในนอกเครื่อง)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. ปุ่มกด (Keypad)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)
<b>Spectrophotometer</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) $\geq 2.5$ VDC
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. ควบคุมเลือกความยาวคลื่น (Wavelength Control)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9. แสงอัลตราไวโอเลต (UV < 3,000 hour)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. แสงที่มองเห็น (Visible < 5,000 hour)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11. ช่องใส่ตัวอย่าง (Carousel Module)
<b>pH Meter and Conductivity Meter</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14. ฝาปิดกันฝุ่น Electrode (Dust Protection Hood)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)
<b>Turbidimeter</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16. ค่าความขุ่นค่าสูง (No Sample)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17. ระดับการส่องสว่างของแสง ( $\geq 2.5$ ไม่นาน 3.0)
<b>Automatic titrator</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	18. ฝาปิด Piston Burettes
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	19. Function Rinsing and Dosing
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ

อุณหภูมิ: Electrode ควบคุมอุณหภูมิ 24.9 °C โดย Control Waterbath ที่ 25.0  $\pm$  0.1 °CMr. Wasan Nuchnebe  
Service Engineer

เอกสารไม่ควบคุม

SPCC-FM-R31-02: 23 Nov 2020


 TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
54/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3000-21 FAX: 0-2719-9484
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.012/2583  
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 90 %  
Calibrated by : Kunchit Promprat  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Malee 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 1: Equipment Calibration and Testing Service

เอกสารไม่ควบคุม


 Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1  
Procedure used :-  
Cert.No.: 22MM210  
Page: 2 of 3

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


 Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1
Cert.No.: 22MM210  
Page: 3 of 3

## Result of calibration

## 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

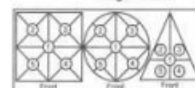
Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0002	-0.0001	0.0000	-0.0002	-0.0002	0.0002

## 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 %.

-o00-



Maximum difference between off-center and central loading (g)

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Cert. No.: 22TM1490  
Page : 1 of 3

## Certificate of Calibration

Equipment : Hot Air Oven  
Manufacturer : Memmert  
Model : UF 55  
Serial No. : B216.1666  
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 :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Preecha Hahab  
Approved by :   
( ) Pornthippa Tameyskul  
( ) Malee Butkruea  
(✓) Suwit Imjai

Issue Date : 31 October 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0046800



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0575OC-1  
Procedure Used :-

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

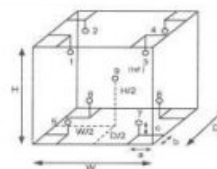
2. This certificate is valid only to the item calibrated on date and place of calibration.

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  
b = 5.0 cm  
c = 5.0 cm  
Dimension of Chamber :  
D = 0.33 m  
W = 0.40 m  
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

เอกสารไม่ควบคุม

a 1133252



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0575OC-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								
	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	139.585	140.369
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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เอกสารไม่ควบคุม

a 1133251



Cert. No.: 22TM90  
Page: 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : Arco  
Model : UC4-1320  
Serial No. : 13URC4S013201  
ID No. : UAE.WAO.015/2561  
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 : 17 February 2022  
Calibration Date : 17 February 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Kunchit Promprat  
Approved by :   
( ) Pornthippa Tameyskul  
(✓) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0038099





Equipment : BOD Incubator  
 Condition As-Received : Used Item  
 Reference : 2202-0446OC-1  
 Procedure Used :-

Cert. No.: 22TM90  
 Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date  
 1) Data Acquisition 34970A MY44035217 21LM30 23 Dec 2022

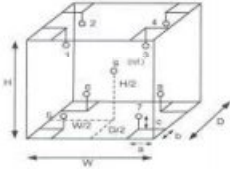
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 :

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

#### Dimension of Chamber :

D = 0.62 m  
 W = 1.2 m  
 H = 1.2 m  
 Capacity = 0.89 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	28
REL Humid. ( % )	68	75
AC Supply ( Volt )	226	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  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source  
 Fresh air setting : Not Available

Cert. No.: 22TM90  
 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
20.0	19.5	19.4	0.30	0.58	1.0	0.56	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	1	2	3	4	5	6	7	8	9 (ref.)

20.0	20.154	20.013	20.356	19.939	19.834	19.761	19.817	19.824	19.922
------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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 %.

-080-

เอกสารไม่ควบคุม  
 A 1096041



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
 334/8 PATTANAKARN ROAD SOI 18, SUANLEANG, SUANLEANG BANGKOK 10250  
 TEL. 0 2715-3000-27 FAX. 0 2715-9484



Cert. No.: 22TM305  
 Page.: 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. : -

ID No. : UAE.WAO.018/2551

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 : 7 April 2022

Calibration Date : 7 April 2022

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

( ) Pornthippa Tameyakul  
 ( ) Malee Butkruea  
 ( ) Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม  
 A 0040246



Equipment : BOD Incubator  
 Condition As-Received : Used Item  
 Reference : 2204-0015OC-2  
 Procedure Used :-

Cert. No.: 22TM305  
 Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date  
 1) Data Acquisition 34970A MY41021843 22LM4 10 Jan 2023

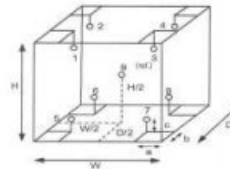
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



#### Probe Installation Details :

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

#### Dimension of Chamber :

D = 0.62 m  
 W = 1.2 m  
 H = 1.2 m  
 Capacity = 0.89 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	27	27
REL Humid. ( % )	56	59
AC Supply ( Volt )	222	221

Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09

เอกสารไม่ควบคุม  
 A 1104314



Equipment : BOD Incubator  
 Condition As-Received : Used Item  
 Reference : 2204-0015OC-2  
 Result of Calibration : ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source  
 Fresh air setting : Not Available

Cert. No.: 22TM305  
 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
20.0	20.0	20.0	0.50	0.44	1.1	0.64	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.080	20.056	19.866	19.826	19.655	19.656	19.819	19.979	19.899

**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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เอกสารไม่ควบคุม

a 1104313

## Calibration Certificate

**Certificate No.:** 2203120-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udumuk 41, Sukhumvit Road,  
 Bangchack, Prakhnong, Bangkok 10260

Page 1 of 3

**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** AB204-S/FACT  
**Serial No.:** 1129361010  
**ID No.:** UAE.WAS.002/2552  
**Order No.:** 2203120  
**Operation No.:** 2203120-001  
**Date of Receipt:** 1 June 2022  
**Date of Calibration:** 1 June 2022

**Calibrated by** Mr.Taveesak Selee  
 Scientist  
**Approved by** (Mr.Pheraphat Tuanjit)  
 Manager, Division of Calibration Laboratory  
 Responsible for the Technical Management Team  
**Date of Issue:** 7 June 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

เอกสารไม่ควบคุม

2008 บ่อจตุรรมุข 36 หมู่ 5 ต.จตุรรมุข อ.เมือง จ.กรุงเทพมหานคร  
 2008 Soi 36, Anurak Road, Bang Yi Khan Subdistrict, Bang Thai District, Bangkok 10700, Thailand  
 Tel: +66(0) 2462 8608 Fax: +66(0) 2462 8545

## Calibration Report

**Certificate No.:** 2203120-001-01  
**Equipment:** Electronic Balance  
**Model:** AB204-S/FACT  
**Serial No.:** 1129361010  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.002/2552

**Date of Calibration:** 1 June 2022 Page 2 of 3

**Environment Condition:** Ambient Temperature: 19.9 ± 0.3 °C Relative Humidity: 45 ± 1.5 %

**Place of Calibration:** 106, Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

**Condition of Equipment:** Good Condition

**Condition of This Results of Calibration:**

1. Calibration Method: NFI Method W-AM-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	830806554	TCS	M22010205	6 January 2022
Standard Weight Class E2	1-500g	8308068128	TCS	M22010215	6 January 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFI.BTH 010/18	Quality Room	GR22-0100	18 February 2022

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:**

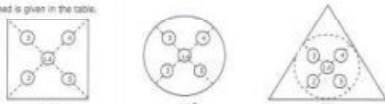
1. Repeatability of Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000048
200	0.000052

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	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
49.9999	49.9998	49.9998	49.9999	49.9998	49.9998	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

## Calibration Report

**Certificate No.:** 2203120-001-01  
**Equipment:** Electronic Balance  
**Model:** AB204-S/FACT  
**Serial No.:** 1129361010  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.002/2552

**Date of Calibration:** 1 June 2022 Page 3 of 3

**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
0.001	0.00000	0.0000	0.0000	0.000088	2.00
0.01	0.01000	0.0100	0.0000	0.000088	2.00
0.05	0.05000	0.0499	0.0001	0.000088	2.00
0.1	0.10000	0.1000	0.0000	0.000088	2.00
0.2	0.20000	0.2000	0.0000	0.000088	2.00
0.5	0.50000	0.5000	0.0000	0.000088	2.00
1	1.00000	0.9999	0.0001	0.000088	2.00
2	2.00000	1.9999	0.0001	0.000088	2.00
5	5.00000	5.0000	0.0000	0.000088	2.00
10	9.99998	9.9999	0.0001	0.000094	2.00
20	19.99999	19.9999	0.0001	0.000094	2.00
50	49.99999	49.9999	0.0001	0.00011	2.00
70	69.99999	69.9999	0.0001	0.00014	2.00
100	100.00001	99.9999	0.0001	0.00017	2.00
150	149.99999	149.9997	0.0002	0.00022	2.00
200	200.00007	199.9998	0.0002	0.00030	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 %.

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

2008 บ่อจตุรรมุข 36 หมู่ 5 ต.จตุรรมุข อ.เมือง จ.กรุงเทพมหานคร  
 2008 Soi 36, Anurak Road, Bang Yi Khan Subdistrict, Bang Thai District, Bangkok 10700, Thailand  
 Tel: +66(0) 2462 8608 Fax: +66(0) 2462 8545





Cert. No.: 22TM563  
Page: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** IPP 260  
**Serial No. :** V615.0187  
**ID No. :** UAE.MIC.003/2559  
**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 7 April 2022  
**Calibration Date :** 7 April 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Prawit Sodavitchit  
**Approved by :**   
( ) Pornthippa Tameyaskul  
( ) Malee Butkruea  
( ) Suwit Imjai  
**Issue Date :** 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0040248



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2204-0016OC-1  
**Procedure Used :-**

Cert. No.: 22TM563  
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument-  
**Instrument** **Model** **Serial No.** **Cert. No.** **Due Date**  
1 ) Data Acquisition 34870A MY44067817 21LM10 20 Jul 2022

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

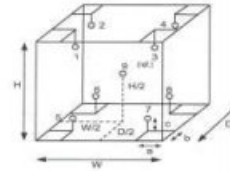
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	26	26
REL.Humid. ( % )	60	62
AC Supply ( Volt )	220	220



**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.50 m  
W = 0.54 m  
H = 0.80 m  
Capacity = 0.26 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/16
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

เอกสารไม่ควบคุม

a 1104310



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2204-0016OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Cert. No.: 22TM563  
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
35.0	35.0	35.0	0.12	0.53	0.79	0.30	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
35.0	1	2	3	4	5	6	7	8	9 (ref.)
	35.170	35.167	34.938	34.844	34.816	34.854	34.584	34.730	34.780

**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 %.

-000-

เอกสารไม่ควบคุม

a 1104309



Cert. No.: 22TM503  
Page: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** IPP 260  
**Serial No. :** V618.0033  
**ID No. :** UAE.MIC.021/2561  
**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory (302)  
**Received Order :** 3 May 2022  
**Calibration Date :** 3 May 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Krisda Malee  
**Approved by :**   
( ) Pornthippa Tameyaskul  
( ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 10 May 2022  
The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : Z205-0003OC-4

Cert. No.: 22TM503  
Page.: 2 of 3

#### Procedure Used :-

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

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY49023932	21LM8	06 Jul 2022

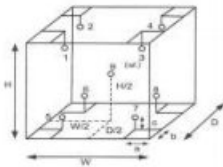
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 :

a = 5.0 cm	D = 0.50 m
b = 5.0 cm	W = 0.64 m
c = 5.0 cm	H = 0.80 m
	Capacity = 0.26 m <sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	23	22
REL Humid. ( % )	53	54
AC Supply ( Volt )	221	220

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	20-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	20-16RTD-08
9 (ref.)	20-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : Z205-0003OC-4  
Result of Calibration :- ( \* ) Without Adjustment

Cert. No.: 22TM503  
Page.: 3 of 3

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
22.0	22.0	22.0	0.051	0.095	0.19	0.30	2
44.0	44.0	44.0	0.10	0.83	1.2	0.32	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
22.0	22.238	22.200	22.139	22.207	22.184	22.178	22.136	22.169	22.161
44.0	44.804	44.670	44.240	44.315	43.974	44.446	43.584	44.209	44.306

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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
334-4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10256  
TEL. 0-2717-3000-21 FAX. 0-2719-9464



Cert. No.: 22TM565  
Page.: 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 14  
Serial No. : L414.1407  
ID No. : UAE.MIC.006/2558  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Microbiology Laboratory  
Location :  
Received Order : 7 April 2022  
Calibration Date : 7 April 2022  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Prawit Sodavitchit  
Approved by :  
( ) Pomthippa Tameyakul  
( / ) Malee Bulkruea  
( ) Suwit Injai  
Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : Z204-0016OC-4

Cert. No.: 22TM565  
Page.: 2 of 3

#### Procedure Used :-

Calibration was conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( iPRT ).

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44087817	21LM10	20 Jul 2022

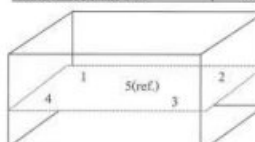
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	62	220
Finished of Calibration	26	65	220



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม





Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2204-0016OC-4  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 22TM565  
 Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.424	44.409	44.478	44.470	44.581

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.22	0.039	0.15	2

**Average\*** : The average of 30 values in each position.  
**Uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.  
**UUC\*** : Unit Under Calibration  
**Note** : The reported uncertainty of measurement was included stability and excluded uniformity.  
 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES  
 334/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0 2715-3000-21 FAX. 0 2719-9484



## Certificate of Calibration

Cert. No.: 22TM332  
 Page.: 1 of 3

Equipment : Water Bath  
 Manufacturer : Memmert  
 Model : WNE 14  
 Serial No. : L416.0514  
 ID No. : UAE.MIC.020/2561  
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong,  
 Bangkok 10260  
 Location : Microbiology Laboratory  
 Received Order : 17 February 2022  
 Calibration Date : 17 February 2022  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %  
 Calibrated by : Suwit Imjai  
 Approved by :   
 Approved Signatory  
 ( ) Ponnitippa Tameyakul  
 ( / ) Malee Butkruea

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95 %

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 Approval of the head of Corporate Services 2: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0038096



Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2202-0444OC-5

Cert. No.: 22TM332  
 Page.: 2 of 3

### Procedure Used :-

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

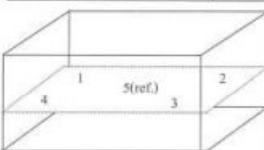
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	21	65	229
Finished of Calibration	22	56	230



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม

a 1096053



Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2202-0444OC-5  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 22TM332  
 Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.546	44.517	44.513	44.537	44.578
50.0	50.0	50.0	50.069	50.051	50.036	50.061	50.092

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.10	0.043	0.15	2
50.0	0.11	0.042	0.15	2

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

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

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

**UUC\*** : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

a 1096052

Mettler-Toledo (Thailand) Ltd.  
845/4 - 845/5 Laksat Rd., Bangna Tai Sae District  
Bangna District, Bangkok 10260  
+66 2722 0362  
MT-TH-Service@support@mt.com



## Accuracy Calibration Certificate

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Bui Udom Bui 41, Suanmum Rd., Bang Chak  
City: Phra Khanong Contact: Suwan Chotek  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number: 

### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument  
Model: MS603S01 Asset Number: UAE.MC.006/2553  
Serial No.: B007E90311 Terminal Model: N/A  
Building: N/A Terminal Serial No.: N/A  
Floor: 2 Terminal Asset No.: N/A  
Room: Balance Room (205)

Range	Max. Capacity	Readability (d)
1	620 g	0.001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
Mettler Toledo Work Instruction: CPW02020  
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/span 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: 22.8 °C End: 23.0 °C	Start: 49.9 % End: 58.3 %

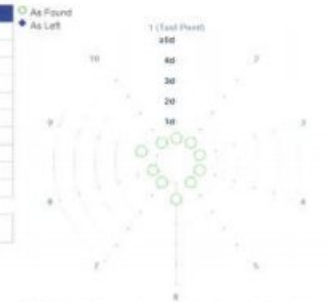
As Found Calibration Date: 07-Apr-2022 Calibration:   
As Left Calibration Date: N/A  
Issue Date: 08-Apr-2022 Approved Signatory:   
☒ Kassakorn Tassanacharekul  
☐ Sani Jitriyorn  
☐ Bursachet Sukkale

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## Measurement Results

### Repeatability

Test Load: 200 g	As Found	As Left
1	200.001 g	N/A
2	200.001 g	N/A
3	200.001 g	N/A
4	200.001 g	N/A
5	200.001 g	N/A
6	200.000 g	N/A
7	200.001 g	N/A
8	200.001 g	N/A
9	200.000 g	N/A
10	200.001 g	N/A
Standard Deviation	0.0004 g	N/A



The "d" 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 difference from the mean value.

### Eccentricity

Test Load: 200 g	Position	As Found	As Left
1	1	200.001 g	N/A
2	2	200.001 g	N/A
3	3	200.002 g	N/A
4	4	200.002 g	N/A
5	5	200.000 g	N/A
Maximum Deviation		0.001 g	N/A

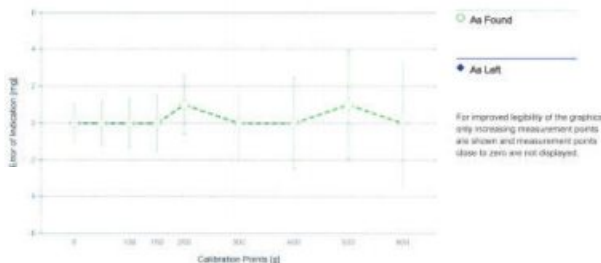


The "d" in the graph represents the readability of the range/interval in which the test was performed.

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### Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000 g	0.000 g	0.000 g	1.0 mg	2
2	0.500 g	0.500 g	0.000 g	1.2 mg	2
3	1.000 g	1.000 g	0.000 g	1.2 mg	2
4	50.000 g	50.000 g	0.000 g	1.2 mg	2
5	100.000 g	100.000 g	0.000 g	1.3 mg	2
6	150.000 g	150.000 g	0.000 g	1.5 mg	2
7	200.000 g	200.001 g	0.001 g	1.6 mg	2
8	300.001 g	300.001 g	0.000 g	2.0 mg	2
9	400.001 g	400.001 g	0.000 g	2.5 mg	2
10	500.001 g	500.002 g	0.001 g	2.9 mg	2
11	600.001 g	600.001 g	0.000 g	3.4 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.

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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: OIML F1

Weight Set No.: W555 Date of Issue: 06-Jun-2021  
Certificate Number: CDM-0137-01-C Calibration Due Date: 07-Jun-2022

#### Weight Set 2: OIML E2

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

#### Thermo Hygrometer

Equipment No.: P1161 Date of Issue: 14-Jun-2021  
Certificate Number: 21H1228 Calibration Due Date: 01-Jun-2022

### Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory

#### End of Accredited Section

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

เอกสารไม่ควบคุม



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

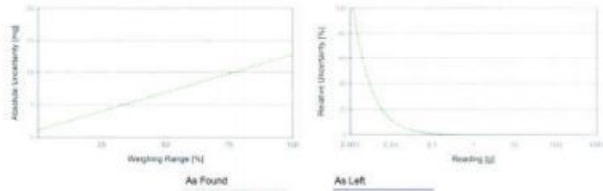
Uncertainty of Uncertainty Equation

Range	d	Max	As Found	As Left
1	0.001 g	525 g	$U_1 = 1.2 \text{ mg} + 0.0185 \text{ mg/g} \cdot R$	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
0.002 g	1.2 mg	1.5%
0.020 g	1.2 mg	0.20%
0.200 g	1.3 mg	0.021%
0.200 g	2.4 mg	0.0038%
0.200 g	13 mg	0.0021%



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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
334/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2713-3000-27 FAX: 0-2719-8464



Certificate of Calibration

Cert. No.: 22TM89  
Page: 1 of 3

Equipment : Autoclave  
Manufacturer : ALP  
Model : CL-40L  
Serial No. : 802664  
ID No. : UAE/MIC.014/2550  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Air Analysis Unit  
Received Order : 17 February 2022  
Calibration Date : 17 February 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ C$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Kunchit Promprat  
Approved by :   
( ) Pomthippa Tarneyakul  
(x) Malee Butkruea  
( ) Suwit Imjai  
Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2202-0444OC-1  
Procedure Used :-  
Cert. No.: 22TM89  
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.  
The temperature scale used was based on ITS-90.

Condition of this result of calibration

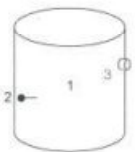
1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

- This certificate is valid only to the item calibrated on date and place of calibration.
  - This certification is traceable to the International System of Unit.
  - This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*
  - \*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )
- It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.
- This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



	Environmental		
	( $^\circ C$ )	( %R.H. )	( Volt )
Beginning of Calibration	27	68	226
Finished of Calibration	27	65	226

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-10TC-01
2 =	Temperature sensor	22-10TC-02
3 =	Exhaust port	22-10TC-03

เอกสารไม่ควบคุม



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2202-0444OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Cert. No.: 22TM89  
Page: 3 of 3

Operating parameter Set : Temperature =  $122 ^\circ C$   
Sterilization period = 30 minute

UUC* Setting ( $^\circ C$ )	UUC* Reading ( $^\circ C$ )	Position	Average* Standard Reading ( $^\circ C$ )	Stability ( $\pm ^\circ C$ )	Pressure Reading ( MPa )	Uncertainty ( $\pm ^\circ C$ )	Coverage Factor k
122	122	1	122.373	0.32	0.12	1.2	2
		2	122.421				
		3	122.292				

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

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

UUC\* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม



Request No. 25-65 / 0398

MTC. ACL.No. 486 / 65

## CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"

Model AA240FS, Serial No. MY13160001

2. Working standard solution "Inorganic Ventures"

Multi Analyte Custom Grade Solution, Lot No. P2-MEB675610

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.

3. Soi Udomsuk41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer (WI-500-02-30)

2. Estimation Uncertainty of Measurement in Analytical Chemistry (QP-513)

REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "Carlo Erba"

Cadmium Lot No. 0108047046, Chromium Lot No. 0106315418, Copper Lot No. 0107480530, Iron Lot No. 0104697566,

Lead Lot No. 0104659473, Manganese Lot No. T109228A, Nickel Lot No. 0104978044, Zinc Lot No. 0100792297

CALIBRATION RANGE : 0.02,0.10,0.30,0.50,0.70 mg/l at 228.8 nm Cd, 0.10,0.20,0.30,0.50,0.70 mg/l at 357.9 nm Cr,

0.05,0.10,0.30,0.50,0.70 mg/l at 324.7 nm Cu, 0.10,0.30,0.50,0.70,1.00 mg/l at 248.3 nm Fe, 0.20,0.50,0.70,1.00,1.50 mg/l

at 217.0 nm Pb, 0.05,0.10,0.30,0.50,0.70 mg/l at 279.5 nm Mn, 0.10,0.30,0.50,0.70,1.00 mg/l at 232.0 nm Ni,

0.05,0.10,0.30,0.50,0.70 mg/l at 213.9 nm Zn

AMBIENT CONDITIONS : Temperature 22 °C. Relative humidity 60 %

The Atomic Absorption Spectrophotometer set has been calibrated against Reference Material traceable to National Institute of Standards and Technology ( NIST ) by The Analytical Chemistry Laboratory. The results are attached herewith.

Calibrated by   
( Mr. Danai Srithongkum )

Approved by   
( Mrs. Thippaya Juvinee Fortune )  
Director of Analytical Chemistry Laboratory  
Ref. 2025265020400522001  
Calibration Date : 3 February 2022

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## 2. Precision

Element	Conc. (mg/l)	Absorbance										Ave. Abs.	SD	%RSD
Cd	0.02	0.0074	0.0062	0.0065	0.0062	0.0070	0.0068	0.0070	0.0065	0.0065	0.0069	0.007	0.0004	5.76
	0.30	0.0952	0.0959	0.0951	0.0957	0.0952	0.0950	0.0952	0.0948	0.0956	0.0943	0.095	0.0005	0.49
	0.70	0.2213	0.2180	0.2203	0.2208	0.2234	0.2211	0.2196	0.2219	0.2201	0.2194	0.221	0.0015	0.67
	0.10	0.0096	0.0098	0.0097	0.0102	0.0106	0.0097	0.0098	0.0099	0.0103	0.0093	0.010	0.0004	3.83
Cr	0.30	0.0309	0.0302	0.0300	0.0316	0.0306	0.0299	0.0309	0.0297	0.0311	0.0296	0.030	0.0007	2.20
	0.70	0.0659	0.0667	0.0664	0.0648	0.0656	0.0662	0.0658	0.0638	0.0649	0.0669	0.066	0.0011	1.70
Cu	0.05	0.0080	0.0075	0.0078	0.0075	0.0077	0.0081	0.0080	0.0075	0.0074	0.0076	0.008	0.0003	3.26
	0.30	0.0417	0.0419	0.0412	0.0421	0.0424	0.0420	0.0423	0.0403	0.0418	0.0415	0.042	0.0006	1.47
	0.70	0.0969	0.0965	0.0972	0.0957	0.0961	0.0958	0.0961	0.0963	0.0959	0.0972	0.096	0.0006	0.58
	1.00	0.0090	0.0105	0.0078	0.0099	0.0091	0.0093	0.0096	0.0094	0.0093	0.0084	0.009	0.0007	8.11
Fe	0.30	0.0462	0.0470	0.0464	0.0464	0.0467	0.0462	0.0467	0.0460	0.0468	0.0466	0.047	0.0003	0.67
	1.00	0.0867	0.0886	0.0910	0.0892	0.0897	0.0873	0.0892	0.0885	0.0888	0.0874	0.089	0.0013	1.43
	0.20	0.0091	0.0095	0.0088	0.0087	0.0082	0.0094	0.0090	0.0087	0.0082	0.0090	0.009	0.0004	4.94
Pb	0.70	0.0322	0.0321	0.0324	0.0318	0.0335	0.0326	0.0327	0.0315	0.0336	0.0321	0.032	0.0007	2.09
	1.50	0.0653	0.0645	0.0663	0.0664	0.0652	0.0671	0.0662	0.0666	0.0657	0.0648	0.066	0.0008	1.28
	0.05	0.0092	0.0092	0.0097	0.0087	0.0085	0.0079	0.0096	0.0085	0.0084	0.0099	0.009	0.0007	7.33
Mn	0.30	0.0616	0.0630	0.0632	0.0633	0.0634	0.0628	0.0640	0.0633	0.0640	0.0629	0.063	0.0007	1.08
	0.70	0.1394	0.1366	0.1386	0.1377	0.1386	0.1386	0.1396	0.1380	0.1374	0.1383	0.138	0.0009	0.67
	0.10	0.0102	0.0092	0.0097	0.0104	0.0091	0.0105	0.0105	0.0096	0.0098	0.0102	0.010	0.0005	5.22
Ni	0.50	0.0488	0.0489	0.0489	0.0495	0.0486	0.0490	0.0481	0.0492	0.0495	0.0492	0.049	0.0004	0.91
	1.00	0.0976	0.0979	0.0975	0.0992	0.0977	0.0973	0.0986	0.0962	0.0985	0.0982	0.098	0.0008	0.85
	0.05	0.0340	0.0349	0.0340	0.0352	0.0337	0.0351	0.0344	0.0346	0.0349	0.0343	0.035	0.0005	1.49
Zn	0.30	0.1669	0.1653	0.1628	0.1642	0.1657	0.1637	0.1659	0.1652	0.1654	0.1657	0.165	0.0012	0.72
	0.70	0.3456	0.3467	0.3445	0.3430	0.3422	0.3404	0.3437	0.3438	0.3435	0.3438	0.344	0.0013	0.37

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## CALIBRATION DATA

## 1. Noise Level in term of standard deviation

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	-0.0004	0.0002	0.0007	0.0002	-0.0016	-0.0001	-0.0004	-0.0001
	0.0002	-0.0005	0.0010	0.0007	0.0000	-0.0003	0.0007	-0.0014
	-0.0002	0.0001	0.0008	0.0000	-0.0001	-0.0003	-0.0012	-0.0006
	0.0000	-0.0007	0.0007	0.0000	-0.0005	-0.0004	-0.0004	-0.0012
	0.0001	0.0004	0.0013	0.0014	-0.0001	-0.0001	0.0003	-0.0008
	0.0000	-0.0004	0.0003	-0.0012	-0.0005	-0.0007	-0.0004	-0.0008
	0.0000	-0.0009	0.0009	-0.0002	-0.0010	-0.0008	0.0007	-0.0003
	-0.0004	-0.0003	0.0015	0.0010	-0.0005	-0.0003	-0.0002	-0.0004
	0.0004	0.0008	0.0014	-0.0004	-0.0014	-0.0005	-0.0006	-0.0003
	-0.0006	-0.0013	0.0012	-0.0006	-0.0006	-0.0006	-0.0007	-0.0007
	0.0005	-0.0003	0.0014	-0.0004	-0.0008	-0.0003	-0.0006	-0.0011
	-0.0007	-0.0014	0.0004	-0.0001	-0.0001	0.0000	0.0000	-0.0003
	0.0008	0.0004	0.0005	-0.0006	-0.0008	0.0000	-0.0005	-0.0009
	0.0011	0.0002	0.0005	0.0017	-0.0016	-0.0008	0.0004	-0.0005
	0.0002	0.0010	0.0014	-0.0002	-0.0010	-0.0010	0.0002	-0.0001
	0.0001	-0.0011	0.0011	-0.0003	-0.0011	-0.0003	-0.0008	-0.0012
	0.0000	-0.0015	0.0009	-0.0010	-0.0010	-0.0013	0.0000	-0.0004
	0.0015	-0.0012	0.0005	0.0002	-0.0017	-0.0001	0.0005	-0.0002
	0.0006	0.0014	0.0010	0.0002	-0.0003	0.0001	-0.0006	-0.0010
	0.0001	0.0003	0.0003	-0.0001	-0.0004	-0.0002	-0.0001	-0.0001
Average Absorbance	0.000	0.000	0.001	0.000	-0.001	0.000	0.000	-0.001
Standard Deviation	0.0005	0.0008	0.0004	0.0007	0.0005	0.0004	0.0005	0.0004

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## 3. Trueness

## 3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.02004	0.019	-0.001	5.19	± 0.004
	0.30060	0.291	-0.010	3.19	± 0.006
	0.70140	0.678	-0.023	3.34	± 0.012

## 3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.1002	0.101	0.001	0.80	± 0.007
	0.3006	0.298	-0.003	0.86	± 0.012
	0.7014	0.635	-0.066	9.47	± 0.023

## 3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.0502	0.046	-0.004	8.37	± 0.004
	0.3012	0.295	-0.006	2.06	± 0.010
	0.7028	0.694	-0.009	1.25	± 0.021

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## 3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.1003	0.106	0.006	5.68	± 0.008
	0.5015	0.522	0.021	4.09	± 0.017
	1.0030	0.993	-0.010	1.00	± 0.032

## 3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.1988	0.197	-0.002	0.91	± 0.014
	0.6958	0.722	0.026	3.77	± 0.022
	1.4910	1.463	-0.028	1.88	± 0.041

## 3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.04955	0.054	0.004	8.98	± 0.004
	0.29730	0.317	0.0197	6.63	± 0.006
	0.69370	0.682	-0.0117	1.69	± 0.012

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## 3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.099	0.102	0.003	3.03	± 0.007
	0.495	0.489	-0.006	1.21	± 0.010
	0.990	0.975	-0.015	1.52	± 0.020

## 3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.050	0.050	0.000	0.00	± 0.012
	0.300	0.307	0.007	2.33	± 0.011
	0.700	0.660	-0.040	5.71	± 0.015

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 (k = 2)  
which gives a level of confidence of approximately 95%

Calibrated by: Danai Srithongkum  
(Mr. Danai Srithongkum)

Approved by: (Mrs. Thippaya Junjee Fortune)  
Director of Analytical Chemistry Laboratory  
Calibration date : 3 February 2022

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## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems 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.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services/analytical-instrument-services>

## Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.
- 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 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

## Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.



## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

## System Information

Instrument system name and ID	ICP 5110 VDV
Instrument system site and location	UAE / 3rd Floor Laboratory
List system component product numbers	List the serial numbers of each component
1. 51805A	1. MY18030001
2. 51805A	2. 1801-01988
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

ICP-OES Configuration table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray (OneNeb) other
Spray Chamber	Cyclonic Single Pass   Cyclonic Double Pass   other
Torch	Radial (Dual View)   other
Injector Diameter	2.4mm   1.8mm   1.4mm   0.8mm   other
Injector Material	Quartz   Ceramic   other

## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### General Preparation

- ☒ Discuss any specific questions or issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Perform general external inspection of system for cleanliness.
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc.
- ☒ Check for required firmware/software updates and verify with customers if they would like it installed.
- ☒ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. *N/A*
- ☒ Run Instrument Performance test and record results in Instrument Performance Test Results Table - Pre PM.

### Inspect and clean the system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVIDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☒ Replace high capacity air inlet dust filter element if installed. *N/A*
- ☒ Remove and clean instrument water inlet filter.

### G8481A Cooling water system

- ☐ **Section NOT Applicable**
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter.
- ☒ Re fill with Polyclear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser by compressed air or vacuum cleaner.

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## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### SPS 3 Auto Sampler

- ☒ **Section NOT Applicable**
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

### SPS 4 Auto Sampler

- ☒ **Section NOT Applicable**
- ☐ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☐ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner
- ☐ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☐ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles

### AVS 4, 6, 7

- ☒ **Section NOT Applicable**
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

### Instrument Adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.
- ☒ Run Instrument Performance Test and record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above run the following Instrument tests and record the result in the Instrument Test Results Table
  - ☒ Subsystem Communications Test
  - ☒ Air Flow

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## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

### Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial*
Zn 213.857 nm SRBR	4100.6	8364.0	4375.0	8400.8
Mn 257.610 nm SRBR	11064.7	31842.1	12801.7	30846.2
Al 306.152 nm SBR	7.5	14.9	9.9	16.8
K 766.491 nm SBR	5.1	36.8	6.4	39.7

\* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

### Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

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## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode	Plasma On
Mains Voltage	229.540 VAC	227.313 VAC
Mains Current	0.104 A	0.104 A
Instrument Temperature	22.6 °C	22.7 °C
RF Air Flow (sensor speed)	15.0 Hz	15.0 Hz
Plasma Exhaust Temperature	No measurement	26.7 °C
Water Flow Oscillator	No measurement	1.64 L/min
Water Flow Detector	1.06 L/min	1.06 L/min
Water Inlet Temperature	18.0 °C	18.0 °C
Polychromator Temperature	35.0 °C	35.0 °C
CCD Temperature	-39.8 °C	-39.8 °C
Thermal Stabilizer	35.0 °C	35.0 °C
Argon Supply Pressure	671.94 kPa	677.33 kPa
Purge Gas Supply Pressure*1	674.30 kPa	645.40 kPa
Option Gas Supply Pressure*1	N/A kPa	N/A kPa
Nebulizer Flow	No measurement	0.70 L/min
Nebulizer Back Pressure	No measurement	164.63 kPa
Plasma Gas Flow	No measurement	11.92 L/min
Auxiliary Gas Flow	No measurement	1.00 L/min
RF Power	No measurement	1200 W
RF Supply Current	No measurement	8.663 A
RF Supply Voltage	No measurement	164.66 V

\*1 If option installed

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**Agilent 5110 and 5100 ICP-OES  
Preventive Maintenance Checklist**
**ICP-OES Parts List Table**

Part description	Part Number	Product / Model # where used	Quantity Consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Polyclear Cooling Fluid	G3202-80010	G8481A	
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	
<b>Additional Parts may be required from engineers stock:</b>			
X axis drive belt	5410047500	SPS 3	
Z axis drive belt	5410047400	SPS 3	
Peristaltic pump tubing, PVC SofaFlex, 3 bridged,	3710049000	SPS 4	

**Restore system**

For HF applications, ask the customer to reinstall their sample introduction system.

Leave system in an idle state: on and purging.

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.

**Service Review**

- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section below if there are additional comments.

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**Agilent 5110 and 5100 ICP-OES  
Preventive Maintenance Checklist**

- ☒ 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 IQ records.

**Service Engineer Comments (optional)**

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

**Other Important Customer Web Links**

How to get information on your product:

- ☒ Literature Library - <http://www.agilent.com/en-us/products/icp-oes/icp-oes-systems/5110-icp-oes#literature>
- ☒ Need to know more? - <http://www.agilent.com/crosslab/university/>
- ☒ Need technical support, FAQs? - <http://www.agilent.com/en-us/support/landing/icp-oes>
- ☒ Need supplies? - [www.agilent.com/chem/supplies](http://www.agilent.com/chem/supplies)

**Service Completion**

Service request number 6005685927 Date service completed 30 Nov 2022

Agilent signature Wongjit T. Customer signature [Signature]

Document part number: G8014-90075

Issued: 3 February 2017, Revision: 1.1

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เอกสารไม่ควบคุม

**Report Summary**

Instrument Model Agilent 5100/5110 VDV ICP-OES  
Instrument ID G8011A/G8015A  
Instrument Serial Number MY18030001  
Software Version 7.3.1.9507  
Firmware Version 3442  
Tested By Test Before PM  
Test Completed On 11/30/2022 9:35:32 AM

**Result Summary**

Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass

เอกสารไม่ควบคุม

**Resolution Test**

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	6.62
As (188.980 nm)	≤ 8.20	6.20
C (193.027 nm)	≤ 11.50	8.35
Mo (202.032 nm)	≤ 8.20	6.41
Cr (206.156 nm)	≤ 13.40	9.04
Zn (213.857 nm)	≤ 8.70	6.62
Pb (220.353 nm)	≤ 9.50	7.13
Co (228.615 nm)	≤ 17.20	11.71
Ba (230.424 nm)	≤ 9.40	7.21
Mn (257.610 nm)	≤ 13.30	9.50
Mn (260.568 nm)	≤ 20.30	14.33
Cr (267.716 nm)	≤ 11.00	8.14
Cu (324.754 nm)	≤ 25.00	18.96
Cu (327.395 nm)	≤ 14.20	11.24
Sr (338.071 nm)	≤ 33.50	24.47
Ba (455.403 nm)	≤ 44.00	33.88
Sr (480.733 nm)	≤ 36.00	17.22
Ba (493.406 nm)	≤ 36.00	25.48
Ba (614.171 nm)	≤ 42.00	25.47
Ar (675.283 nm)	≤ 74.00	59.62
K (766.491 nm)	≤ 80.00	64.94

**Pass**

เอกสารไม่ควบคุม

Sensitivity Test					
Pass					
Radial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	147.7	1156.5	55.5
Se (196.026 nm)	≥ 41.0	SRBR	111.1	1195.3	97.7
Zn (213.857 nm)	≥ 1421.0	SRBR	4100.6	51959.5	159.6
Pb (220.353 nm)	≥ 46.0	SRBR	192.5	2808.6	185.7
Mn (257.610 nm)	≥ 3518.0	SRBR	11084.7	264165.0	567.6
Al (396.152 nm)	≥ 3.4	SBR	7.5	49047.9	5770.5
Ba (493.408 nm)	≥ 34.0	SBR	107.4	1887710.3	17407.5
K (766.491 nm)	≥ 1.8	SBR	5.1	100805.9	16626.4
Axial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	234.9	3056.4	152.9
Se (196.026 nm)	≥ 159.0	SRBR	218.1	3865.1	271.6
Zn (206.200 nm)	≥ 234.0	SRBR	1306.5	15850.4	144.5
Zn (213.857 nm)	≥ 1743.0	SRBR	8364.0	183037.8	476.4
Cd (214.439 nm)	≥ 4227.0	SRBR	7718.5	143240.2	342.8
Pb (220.353 nm)	≥ 320.0	SRBR	576.3	14465.2	580.4
Mn (257.610 nm)	≥ 10625.0	SRBR	31842.1	1411257.3	1958.9
Cr (267.716 nm)	≥ 1048.0	SRBR	4492.1	183110.6	1632.2
Cu (324.754 nm)	≥ 19.0	SBR	46.2	371487.5	7862.9
Al (396.152 nm)	≥ 6.0	SBR	14.9	278447.4	17552.6
Ba (493.408 nm)	≥ 60.0	SBR	190.6	10061527.3	52519.8
K (766.491 nm)	≥ 24.0	SBR	36.8	1922163.4	50858.1

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เอกสารไม่ควบคุม

Precision Test			
Pass			
Radial			
Element Wavelength	Specification	Measured Value	% RSD
As (188.980 nm)	≤ 2.60	0.82	
Se (196.026 nm)	≤ 2.60	0.71	
Zn (213.857 nm)	≤ 1.50	0.43	
Pb (220.353 nm)	≤ 2.60	0.76	
Mn (257.610 nm)	≤ 1.50	0.60	
Al (396.152 nm)	≤ 1.50	0.48	
Ba (493.408 nm)	≤ 1.50	0.89	
K (766.491 nm)	≤ 1.50	0.42	
Axial			
Element Wavelength	Specification	Measured Value	% RSD
As (188.980 nm)	≤ 1.50	0.57	
Se (196.026 nm)	≤ 1.50	0.76	
Zn (206.200 nm)	≤ 1.50	0.61	
Zn (213.857 nm)	≤ 1.50	0.51	
Cd (214.439 nm)	≤ 1.50	0.55	
Pb (220.353 nm)	≤ 1.50	0.52	
Mn (257.610 nm)	≤ 1.50	0.54	
Cr (267.716 nm)	≤ 1.50	0.54	
Cu (324.754 nm)	≤ 1.50	0.69	
Al (396.152 nm)	≤ 1.50	0.91	
Ba (493.408 nm)	≤ 1.50	0.85	
K (766.491 nm)	≤ 1.50	1.22	

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เอกสารไม่ควบคุม

Report Summary		
Instrument Model	Agilent 5100/5110 VDV ICP-OES	
Instrument ID	G8011A/G8015A	
Instrument Serial Number	MY18030001	
Software Version	7.3.1.9507	
Firmware Version	3442	
Tested By	PM Functional test	
Test Completed On	11/30/2022 11:43:36 AM	
Result Summary		
Subsystem Communications Test	Pass	
Air Flow Test	Pass	
Water Flow Test	Pass	
Gas Flows Test	Pass	
RF Generator Test	Pass	
Camera Test	Pass	
Optics Test	Skipped	
Advanced Valve System Test	Skipped	
Resolution Test	Skipped	
Sensitivity Test	Skipped	
Precision Test	Skipped	
Subsystem Communications Test	Pass	
Air Flow Test	Pass	
30% Air Flow (relative speed)	75% Air Flow (relative speed)	
14.00	19.00	
Water Flow Test	Pass	
RF Water Flow(L/min)	Camera Water Flow (L/min)	Water Inlet Temperature (°C)
1.44	1.05	18.51

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เอกสารไม่ควบคุม

Gas Flows Test			Pass		
Nebulizer Target Flow	Actual Flow	Back Pressure	Auxiliary Target Flow	Actual Flow	Back Pressure
0.70	0.70	163.37	2.00	1.99	108.49
Makeup Target Flow	Actual Flow	Back Pressure	Plasma Target Flow	Actual Flow	Back Pressure
2.00	2.00	112.85	18.00	17.91	23.46
RF Generator Test			Pass		
RF Power Supply Test		Passed			
RF Power Supply (V)		147.437			
RF Oscillator Test		Passed			
RF Oscillator Frequency (MHz)		0.000			
Work Coil Current (A)		45.069			
RF Power Supply Current (A)		1.997			
Camera Test			Pass		
	Integration Time (ms)	Standard Deviation	Status		
Electronic Offset Test	1000	5.305	Passed		
Dark Current Test	6000	0.578	Passed		
Array Test	5	0.024	Passed		
Linearity Test		0.118	Passed		

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เอกสารไม่ควบคุม



# Report Summary

Instrument Model	Agilent 5100/5110 VDV ICP-OES
Instrument ID	G8011A/G8015A
Instrument Serial Number	MY18030001
Software Version	7.3.1.9507
Firmware Version	3442
Tested By	PM Performance Test
Test Completed On	11/30/2022 12:10:42 PM

## Result Summary

Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Pass
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass

## Optics Test

Pass

	Radial	Axial
Intensity	5674608	5623478
Wavelength	737.212	737.212

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เอกสารไม่ควบคุม

## Resolution Test

Pass

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	6.79
As (188.980 nm)	≤ 8.20	6.09
C (193.027 nm)	≤ 11.50	8.29
Mo (202.032 nm)	≤ 8.20	6.30
Cr (206.158 nm)	≤ 13.40	9.05
Zn (213.857 nm)	≤ 8.70	6.77
Pb (220.353 nm)	≤ 9.50	7.02
Co (228.615 nm)	≤ 17.20	11.67
Ba (230.424 nm)	≤ 9.40	7.39
Mn (257.610 nm)	≤ 13.30	9.48
Mn (260.568 nm)	≤ 20.30	14.25
Cr (267.716 nm)	≤ 11.00	7.94
Cu (324.754 nm)	≤ 25.00	18.99
Cu (327.395 nm)	≤ 14.20	11.33
Sr (338.071 nm)	≤ 33.50	24.44
Ba (455.403 nm)	≤ 44.00	33.86
Sr (460.733 nm)	≤ 36.00	17.51
Ba (493.408 nm)	≤ 36.00	25.56
Ba (614.171 nm)	≤ 42.00	24.96
Ar (675.283 nm)	≤ 74.00	59.38
K (766.491 nm)	≤ 80.00	65.63

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## Sensitivity Test

Pass

Radial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	147.8	1149.3	54.8
Se (196.026 nm)	≥ 41.0	SRBR	111.6	1222.8	101.0
Zn (213.857 nm)	≥ 1421.0	SRBR	4375.0	52592.3	143.7
Pb (220.353 nm)	≥ 46.0	SRBR	199.8	2744.4	166.5
Mn (257.610 nm)	≥ 3518.0	SRBR	12801.7	285591.3	496.0
Al (396.152 nm)	≥ 3.4	SBR	9.9	52888.6	4873.6
Ba (493.408 nm)	≥ 34.0	SBR	154.6	2287291.6	14698.1
K (766.491 nm)	≥ 1.8	SBR	6.4	106701.6	14350.9
Axial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 206.0	SRBR	242.4	3170.1	154.8
Se (196.026 nm)	≥ 159.0	SRBR	226.1	4134.5	289.3
Zn (206.200 nm)	≥ 234.0	SRBR	1126.6	13782.0	146.5
Zn (213.857 nm)	≥ 1743.0	SRBR	8400.8	177166.3	442.5
Cd (214.439 nm)	≥ 4227.0	SRBR	7001.9	125884.2	321.6
Pb (220.353 nm)	≥ 320.0	SRBR	536.3	12909.3	532.6
Mn (257.610 nm)	≥ 10625.0	SRBR	30846.2	1267989.0	1738.8
Cr (267.716 nm)	≥ 1048.0	SRBR	4396.0	167335.6	1424.4
Cu (324.754 nm)	≥ 19.0	SBR	52.1	373690.7	7033.1
Al (396.152 nm)	≥ 6.0	SBR	16.8	268357.7	15112.4
Ba (493.408 nm)	≥ 60.0	SBR	225.2	10173441.5	44971.7
K (766.491 nm)	≥ 24.0	SBR	39.7	1874136.2	46055.7

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## Precision Test

Pass

Radial		
Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 2.60	0.60
Se (196.026 nm)	≤ 2.60	0.84
Zn (213.857 nm)	≤ 1.50	0.29
Pb (220.353 nm)	≤ 2.60	0.59
Mn (257.610 nm)	≤ 1.50	0.28
Al (396.152 nm)	≤ 1.50	0.28
Ba (493.408 nm)	≤ 1.50	0.59
K (766.491 nm)	≤ 1.50	0.23
Axial		
Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 1.50	0.71
Se (196.026 nm)	≤ 1.50	0.43
Zn (206.200 nm)	≤ 1.50	0.46
Zn (213.857 nm)	≤ 1.50	0.37
Cd (214.439 nm)	≤ 1.50	0.48
Pb (220.353 nm)	≤ 1.50	0.48
Mn (257.610 nm)	≤ 1.50	0.74
Cr (267.716 nm)	≤ 1.50	0.26
Cu (324.754 nm)	≤ 1.50	0.51
Al (396.152 nm)	≤ 1.50	0.45
Ba (493.408 nm)	≤ 1.50	0.81
K (766.491 nm)	≤ 1.50	0.84

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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 :   
(Mr. Tanawut Rittidach)

Approved by :   
(Ms. Chonthicha Sangnern)

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 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.

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## REPORT OF CALIBRATION

Certificate No. : SP22-016

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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 Starna 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-700-02 R01 1/11/2021



## REPORT OF CALIBRATION

Certificate No. : SP22-016

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Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor
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

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## 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
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

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FM-700-02 R01 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



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
528.68	528.5	0.36	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 non TISI accredited

- End of Certificate -


เอกสารไม่ควบคุม

FM-708-02 R01 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 : 

( Mr.Tanavut Rimidach )

Technical Manager

Approved by : 

( Ms.Chonthicha Sangsri )

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 use 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.

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.

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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 ± 5 °C

Relative humidity 55 ± 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 Starna 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.


FM-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

FM-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 : dqservicesth@icloud.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 0.7478	0.000 0.746	0.0000 0.0018	0.0050 0.0057	2.00 2.00
257	0.0000 0.8686	0.000 0.861	0.0000 0.0076	0.0050 0.0059	2.00 2.00
313	0.0000 0.2912	0.000 0.291	0.0000 0.0002	0.0050 0.0051	2.00 2.00
350	0.0000 0.6448	0.000 0.638	0.0000 0.0068	0.0050 0.0055	2.00 2.00

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqservicesth@icloud.com

**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 = Unit Under Calibration

- N/A = Not Available

- The most 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 99%.

- \* Indicates see TSI accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqservicesth@icloud.com

**CERTIFICATE OF CALIBRATION**

Certificate No. : SP22-008 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 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by : รวิญญ์ (Mr. Tanawat Rittidach) Technical Manager

Approved by : จุฬจิษฐ์ (Ms. Chonbicha Sangsri) 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 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.

DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqservicesth@icloud.com

**REPORT OF CALIBRATION**

Certificate No. : SP22-008 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 Sarnu Scientific Limited

Spectral Band Width of UUC : 1.5 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.

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FM-708-02 R01 1/11/2021

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DQE Services Co., Ltd.  
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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

**REPORT OF CALIBRATION**

Certificate No. : SP22-008 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	0.576	0.0027	0.0031	2.00
	1.0490	1.046	0.0030	0.0029	2.00
	2.1900	2.182	0.0080	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.559	0.0017	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.116	0.0069	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	0.962	0.0014	0.0029	2.00
	1.9763	1.970	0.0063	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.519	0.0001	0.0031	2.00
	1.0003	0.999	0.0013	0.0033	2.00
	1.9987	1.992	0.0067	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	1.080	0.0009	0.0030	2.00
	2.0391	2.031	0.0081	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.560	0.0001	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.922	0.0074	0.0079	2.00

FM-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. : SP22-008 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	0.747	0.0008	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.865	0.0036	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.290	0.0012	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.640	0.0048	0.0055	2.00

FM-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. : SP22-008 Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.0	0.72	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.0	0.81	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.0	0.93	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.0	0.66	0.18	2.00
460.02	459.5	0.52	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	637.5	0.48	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.0	0.50	0.18	2.00
513.47	513.0	0.47	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	684.0	0.40	0.18	2.00
740.72	740.5	0.22	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.0	0.03	0.18	2.00
879.28	879.5	-0.22	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 ISO 17025 accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

**HANNA instruments** Hanna Instruments (Thailand) Ltd.  
410/67-68 Soi Rachadapisek 24, Rachadapisek Rd., Samsen-nok, Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

Certificate No. : HIT-2209-0184 Page 1 of 3

**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 ± 2 ) °C  
Relative Humidity : ( 50 ± 15 ) % RH  
Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by : *Pichit* Mr. Pichit Pethong Calibration Engineer  
Approved by : *oht* Mr. Anan Suwanchaisakul Authorized Signatory

**HANNA instruments (Thailand) Limited**

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 )

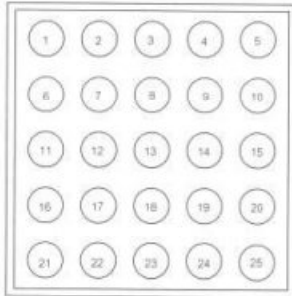
**Reference / Procedure :**

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**



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**Result of Calibration :**

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	- (°C)	150.6 (°C)	1.3 (°C)	± 0.39 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
	1	2	3	4	5
150.0	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

National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Anurak Road, Bang Nuea Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66 (0) 2622 8688 Fax : +66 (0) 2622 8614 Website : www.nfi.go.th E-mail : sugphn@nfi.go.th



**Verification Certificate**

**Certificate No.:** 2202361-001-01  
**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:** HEATING BLOCK DIGESTION

**Manufacturer:** FOSS

**Model:** 2520

**Serial No.:** 91794469

**ID No.:** UAE.WAS.011/2560

**Order No.:** 2202361

**Operation No.:** 2202361-001

**Date of Receipt:** 4 April 2022

**Date of Calibration:** 4-6 April 2022

**Calibrated by** Mr.Nuttapoi Niyomchat Specialist  
**Approved by** ( Mr.Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
**Date of Issue:** 11 April 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.

เอกสารไม่ควบคุม

National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Anurak Road, Bang Nuea Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66 (0) 2622 8688 Fax : +66 (0) 2622 8614 Website : www.nfi.go.th E-mail : sugphn@nfi.go.th



**Verification Report**

**Certificate No.:** 2202361-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
**Model:** 2520 **Serial No.:** 91794469  
**Resolution:** 1 °C **ID No.:** UAE.WAS.011/2560  
**Manufacturer:** FOSS

**Date of Calibration:** 4-6 April 2022 **Page 2 of 4**

**Location:** Laboratory Room, NATIONAL FOOD INSTITUTE  
**Environment Condition:** Ambient Temperature ( 25 ± 3 ) °C  
Relative Humidity ( 55 ± 15 ) %  
Line Voltage ( 220 ± 10 ) Volt

**Condition of this results of Calibration:**

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.  
- The temperature scale used was based on ITS - 90 .  
- All data show below were final values and the initial data may be obtained upon request.

**2. Reference Standard Instrument :**

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34870A/34901A Type R	HY94003276/001100403 TC4300-100 / CH4300-100	TC21/0041	24-Apr-2022	N.F.I. Technical Center Laboratory

- 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.

**6. Condition of Calibrated item :** Good

UUC\* Description

Time of Record - Hour 30 Minute At 380 °C

**7. Result of Calibration :** ☒ Without adjustment ☐ After adjustment

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## Verification Report

Certificate No.:

2202361-001-01

Equipment:

HEATING BLOCK DIGESTION

Model: 2520

Serial No.: 91794469

Resolution: 1 °C ID No.: UAE.WAS.011/2560

Manufacturer: FOSS

Date of Calibration:

4-6 April 2022

Page 3 of 4

Calibration point:

380 °C

Calibration result:

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.13	376.48	1.5
2	380	380	0.12	376.58	1.5
3	380	380	0.12	376.51	1.5
4	380	380	0.14	376.70	1.6
5	380	380	0.18	376.81	1.6
6	380	380	0.12	377.23	1.6
7	380	380	0.12	377.37	1.5
8	380	380	0.13	376.68	1.5
9	380	380	0.14	376.72	1.5
10	380	380	0.18	378.97	1.6
11	380	380	0.25	378.79	1.6
12	380	380	0.11	377.14	1.6
13	380	380	0.19	379.65	1.6
14	380	380	0.16	379.61	1.6
15	380	380	0.16	378.66	1.6
16	380	380	0.15	379.18	1.6
17	380	380	0.23	377.39	1.6
18	380	380	0.11	377.71	1.6
19	380	380	0.22	376.64	1.6
20	380	380	0.16	376.56	1.6

Note:

- UUC\* = Unit Under Calibration

- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.

- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

F-CS-612 Revision: 00 Date: 14-12-61

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## Verification Report

Certificate No.:

2202361-001-01

Equipment:

HEATING BLOCK DIGESTION

Model: 2520

Serial No.: 91794469

Resolution: 1 °C ID No.: UAE.WAS.011/2560

Manufacturer: FOSS

Date of Calibration:

4-6 April 2022

Page 4 of 4

Calibration point:

380 °C

Calibration result:

Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Note:

- UUC\* = Unit Under Calibration

- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.

- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

F-CS-612 Revision: 00 Date: 14-12-61

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## Customer Service Report

Date:	25/12/2022	Customer:	United Analytical and Engineering
Instrument:	KT9100	Serial:	31889052
Hours Start:	9:30	Hours Finish:	3:30
Travel To Customer:	30 mins	Labour:	3 hrs
Travel From Customer:	1 hrs		

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: PMA Type Contract No.

PMA Type Contract No.

PMA Type Contract No.

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PMA Type Contract No.

FOSS

## Customer Service Report

Date:	25/12/2022	Customer:	United Analytical and Engineering
Instrument:	KT9100	Serial:	31889052
Hours Start:	9:30	Hours Finish:	3:30
Travel To Customer:	30 mins	Labour:	3 hrs
Travel From Customer:	1 hrs		

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: PMA Type Contract No.

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PMA Type Contract No.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

## Kjeltec™ 8100 Distillation Unit

This IQ applies to Kjeltec™ 8100 Distillation Unit manufactured by FOSS Analytical. The installation is performed by FOSS trained service personnel.

## 1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical AB's Application Notes.

## 2 Purpose

This installation Qualification is designed to assure that:

- The Kjeltec instrument is received complete, with all required parts in good condition.
- The location of the instrument is environmentally and ergonomically suitable
- The instrument is assembled and configured correctly
- Suitable electricity and water are supplied to the instrument, see table 2 for requirements.

## 3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit	๑1๙ ๙9๐52

## Dedicated Analytical Solutions

FOSS Analytical AS  
89 Slangerupgade  
DK-3400 Hillerød  
Denmark

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Fax +45 7010 3371  
E-mail: support@foss.dk  
Web: www.foss.dk

FOSS Analytical AB  
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Sweden

Tel +46 42 381199  
Fax +46 42 340348  
E-mail: support@foss.se  
Web: www.foss.se

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## 4 Control of Received Equipment

## 4.1 Verify that the correct instrument type and accessory kit items are received and in proper condition

The packing list (shipped with the instrument) specifies all the items. The installer will verify that all items are received as shipped on the packing list. For each item listed, verify that the acceptance criteria are met. If so, write "Y" in the right column of the table immediately following.

Packing List Item	Acceptance Criteria	Pass/Y/N
Kjeltec 8100 Distillation Unit	No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Accessory kit, according to packing list	Included. No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Handling device for digestion tube	Included. No visible damage.	Y
Tanks with level sensors for Waste, Alkali and Water	Included. No visible damage.	Y
Receiver flask	Included. No visible damage.	Y
One digestion tube 250ml	Included. No visible damage.	Y
One digestion tube 100 ml	Included. No visible damage.	Y
Tube adapter	Included. No visible damage.	Y
User manual	Kjeltec 8100 Distillation Unit	Y
Owners guide	Kjeltec 8100 Distillation Unit	Y
Quick guide	Kjeltec 8100 Distillation Unit	Y
Spare parts manual	Kjeltec 8100 Distillation Unit	Y
Application notes	AN 300 included AN 303 included	Y

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## 5 Installation

## 5.1 The equipment must be installed in a suitable location with power, water and draining available

Verify that the instrument installation site meets the acceptance criteria given in the table below. If so, write "Y" in the right column of the table immediately following.

Location Requirements	Acceptance Criteria	Pass (Y/N)
Adequate space for instrument	Dimensions 48x58x69 cm	Y
AC supply available for instrument	200-240 V 50/60Hz	Y
Current	10 A	Y
Cold water supply available	2 L/min at 30°C	Y
Drain	For cooling water and waste (depending on local waste disposal legislation)	Y
Ambient temperature	Max. 40°C	Y
Ambient humidity	Max. 80% relative	Y
Internal fuses	T10A AH	Y

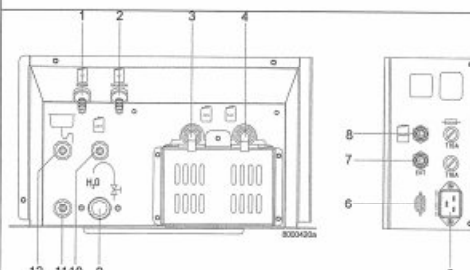
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## 5.2 The instrument must be assembled correctly

Verify that all tubes are correctly connected. If so, write "Y" in the right column of the table immediately following.

Instrument Tubing Connections	Acceptance Criteria	Pass (Y/N)
 <p>1. Deionised water in (steam generator) 2. Deionised water in (dilution water) 3. *) Receiver solution in 4. Alkali in 5. Power 6. Not used 7. External titration module 8. Level sensors 9. Cooling water in (tap water) 10. Waste water out (tube drain vessel) 11. Drain 12. Cooling water out (tap water) *) Only on Kjeltec 8200</p>	Visual verification by installer	Y

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### 5.3 The instrument should be assembled and powered up

Connect the distilling unit to the power supply. Perform the start up procedure and check that the expected response is obtained. If so, write "Y" in the right column of the table immediately following.

Action	Expected Response	Pass (Y/N)
Switch on the power	The instruments start up and the self test will run. The sample counter shows the number of analysed samples since first power and the Software Version shows the version of the instruments software.	Y
	After start-up, Program 1 is loaded and the Analyse menu is displayed.	Y
Turn on the cold water tap	No visible reaction	Y
Press the "Manual" view	The Manual menu is opened	Y
Open the door with the handle, place the test tube and receiver flask in position. Close the door.		Y
Select <b>Dilution</b> and press <b>Start</b>	Water is added to the tube	Y
Select <b>Alkali</b> and press <b>Start</b>	Alkali is added to the tube	Y
Select <b>Steam</b> and press start	After heating up, steam is entering the tube	Y
Select <b>Drain</b> and press <b>Start</b>	The tube is drained	Y

### 6 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

### 7 IQ Documentation

Upon successful completion and recording of all instructions above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

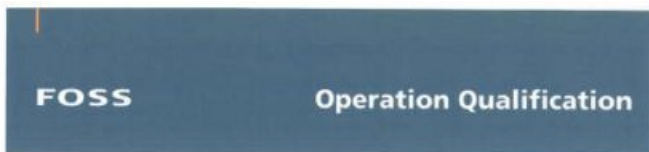
Installed By: Pannipa Onnong

Company: Foss SEA

Customer Name: United Analyst and Engineering

Company: United Analyst and Engineering

Date completed: July 25, 2022



### Kjeltec™ 8100 Distillation Unit

This OQ applies to Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The operation qualification is performed by FOSS trained service personnel.

#### 1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical Application Notes.

#### 2 Purpose

This procedure is designed to test the function of the instrument according to factory test specifications:

- Alkali volume
- Distillation Accuracy
- Distillation Repeatability

#### 3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit, 200-240 V 50/60 Hz	91164052

### 4 Performance

#### 4.1 Verify the dispensed volumes of reagents

Note! To verify the dispensed volumes of reagents a triple test should be done to be statistic correct. Then calculate a mean value.

- Choose "Manual" in the menu. (When starting up the instrument Program 1 is loaded)
- Open the safety door by pressing **Open** and place a tube in the instrument. Close the safety door.

#### Water

- Press **Dilution** and then press **Start**. 80 ml of water will be filled into the tube.
- Measure the collected water in a graduated measuring glass and note the result in table 1 below.
- Check acceptance criteria in the table and make the judgment if passed or not.

Note! If the water volume needs to be calibrated, go to 4.8.5 Dilution Pump Calibration in the User Manual.

#### Alkali

- Press **Alkali** and then press **Start**. 50 ml of alkali will be filled into the tube.
- Measure the collected alkali in a graduated measuring glass and note the result in table 1 below.
- Check acceptance criteria in the table and make the judgment if passed or not.

Table 1 Volume control

Test	Result	Expected result	Passed (Y/N)
Water volume	81 ml	76- 84 ml	Y
	81 ml		
	81 ml		
	Mean 81 ml		
Alkali volume	51 ml	47- 54 ml	Y
	51 ml		
	51 ml		
	Mean 51 ml		

## 4.2 Verify the distillation procedure, accuracy and precision

The distillation principle is to convert ammonium ( $\text{NH}_4^+$ ) into ammonia ( $\text{NH}_3$ ) by using an alkali ( $\text{NaOH}$ ) and thereafter steam distill it into a receiver flask containing boric acid and titrate with standard acid solution using colorimetric end-point detection. Ammonium sulphate, a substance with known ammonia content, can be used to check the accuracy of the distillation. The recovery is calculated from obtained result.

The way to perform this test will be described in the following.

### Chemical Check

Use ammonium sulphate ( $\text{NH}_4)_2\text{SO}_4$ , purity > 99.5 % \*

Mol. weight = 132.14 g/mol, Nitrogen content in ammonium sulphate (99.5 %) = 21.09% \*

### Analysis conditions according to AN 300

Water	80 ml
Alkali	50 ml NaOH (40%w/w)
Receiver solution	30 ml boric acid (4%)
Distillation time	5 minutes
SAFE	5 seconds
Titrate	0.2N HCl

### For reagent preparation see Appendix A

- Start the instrument and run two blanks without chemicals according to above analysis conditions, distill into a receiver flask containing boric acid. Titrate with a standard acid solution using colorimetric end-point detection. If the blanks are less than 0.2 ml continue with the recovery tests.
- Weigh 0.15 g ammonium sulphate into a tube. Prepare 6 samples (tubes).
- Run the six samples according to above analysis conditions. Titrate with a standard acid solution using colorimetric end-point detection.
- Calculate the recovery according to below equations. Expected results of recovery should be 100%±1%.

Recovery test	Result	Expected result	Passed (Y/N)
Blank value (water blank)	1. 0.09 ml 2. 0.14 ml	0.05-0.20 ml	Y
Recovery	1. 100.32 % 2. 100.10 % 3. 100.85 % 4. 99.21 % 5. 99.93 % 6. 100.81 %		
Accuracy	Mean Value: 100.07	99-101%	Y
Precision	SD: 0.557	SD <1%	Y

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\*) Note! Please also note that the below calculations must be adjusted if other purity levels of ammonium salts are used. A certificate for the chemical supplier should be available

Purity	Nitrogen content
99.5%	21.09%
99.6%	21.12%
99.7%	21.14%
99.8%	21.16%
99.9%	21.18%

$$\% \text{ Nitrogen} = \frac{(m_{\text{sample}} - m_{\text{blank}}) \times N \times 14,007 \times 100}{M_{\text{N}} \times m_{\text{sample}}} \quad \begin{matrix} \nearrow 0.1095 \\ 21.72 \end{matrix}$$

N = Normality of titrant to 4 places of decimal.

$$\% \text{ Recovery} = \frac{\% \text{ Nitrogen}}{21.09} \times 100$$

mg sample  
0.154g 21.54  
⑤  
②  
⑥  
⑦  
①

## 5 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

## 6 OQ Documentation

Upon successful completion of tests above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

Performed By: \_\_\_\_\_

Company: \_\_\_\_\_

Customer Name: \_\_\_\_\_

Company: \_\_\_\_\_

Date completed: \_\_\_\_\_

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## 7 Appendix A

### 7.1 Preparation of Reagents

#### 7.1.1 Alkali

To convert ammonium into ammonia an excess of sodium hydroxide is necessary.

Use 400 g NaOH per litre of solution. Commercially available in concentrations up to 50 %. Do not use concentrations above 40 % as this will lead to crystal formation impairing the function of the pumps. If you can only buy concentrations > 40 %, dilute it before use.

#### 7.1.2 Titrant acid, determination of concentration

To be able to achieve accurate nitrogen / protein results, one must be quite sure that the HCl (hydrochloric acid) concentration is what it is supposed to be. A titration against a predetermined solution of sodium carbonate as described below is thus necessary. Incorrect HCl concentration can otherwise cause substantial errors.

- Standard substance**  
Weigh approx. 10 g of anhydrous sodium carbonate ( $\text{Na}_2\text{CO}_3$ ). Use a mortar to make a fine powder. Dry it for 1 h at 265 °C or 2 h at 200 °C. After cooling in a desiccator, transfer the sodium carbonate to a beaker with a tight lid. Store it in a desiccator.
- Indicator solutions**  
Dissolve 0.1 g methyl red in 100 ml methanol. Dissolve 0.1 g bromocresol green in 100 ml methanol.
- Procedure**  
Weigh approx. 0.4 g of the standard substance, using an analytical balance, note the weight ( $W_1$ ). Transfer the sodium carbonate to a receiver flask and add 40 ml of  $\text{H}_2\text{O}$  (distilled or deionized). Add 8 drops from each of the indicator solutions. Titrate to pink. Note the amount in ml used ( $A_1$ ). Boil this solution for a few minutes. The solution will turn green. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour change occurs. Note also this volume ( $A_2$ ). Boil the solution for a few minutes. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour occurs. Note also this volume ( $A_3$ ).  
**Note!** Temperature changes will influence the volume and the concentration of the titrant solution. The working temperature of the titrant should approximate that of its temperature during standardization. If temperature corrections are necessary, sufficient accuracy may be obtained by use of a correction table. (AOAC 942.25)

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## 7.2 Calculation

$$\text{Molarity (M)} = \frac{18,870 \times W_1}{(A_1 + A_2 + A_3)}$$

**Note!** Concentration must be accurate to four digits, i.e. 0.2000 M.

**Note!** The colour change of this official procedure (AOAC 936.15) may be difficult to see, therefore a pH meter or a mixed indicator (e.g. 0.1 g Methyl red and 0.1 g Bromocresol green in 100 ml methanol) will make it much easier to perform.

## 7.3 Receiver Solution

Boric acid 4 % with bromocresol green / methyl red indicator solution

In order to obtain accurate results the receiver solution is adjusted so that a small (0.05-0.20 ml) positive blank is obtained when running a blank sample. The 4 % boric acid receiver solution is prepared by dissolving 400 g of boric acid in about 5-6 l very hot deionized water. Mix and add more hot deionized water to a volume of about 9 l. Cool the solution to room temperature and add 100 ml of bromocresol green solution (100 mg in 100 ml methanol) and 70 ml of methyl red solution (100 mg in 100 ml of methanol). Dilute to 10 l with deionized water and mix carefully.

**Note!** The addition of alkali is to achieve a positive blank value. This should, however, be kept between 0.05 - 0.20 ml titrant, to obtain good repeatability when testing blanks.

Adjustment of the boric acid is made by the following procedure:

1. Transfer 25 ml boric acid solution to a receiver flask and add 100 ml of distilled water. If the solution in the flask is still red, titrate with 0.1 M sodium hydroxide solution until a neutral grey colour is obtained. Calculate the amount of sodium hydroxide solution necessary to adjust the boric acid solution in the 10 l flask with the formula: ml 1.0 M alkali = ml titrant x 40
2. Add the calculated amount of 1.0 M alkali solution to the boric acid solution. Mix.
3. To check proceed as follows using 25 ml of the boric acid solution. Run a blank. If the value of this blank is high (0.5 ml of 0.2 M HCl) the boric acid is incorrectly adjusted. This might create irregular blanks. For correction add HCl directly into the boric acid tank, mix it carefully and repeat until a reading of 0.05 - 0.20 ml HCl is obtained. If a positive blank is not achieved, add further small quantities of 1 M NaOH and repeat the check until a satisfactory value is achieved.

## Kjeltec™ 8100 Distillation Unit Tecator™ 2508/2520 Digestor

### 1 Scope

This PQ applies to the Digestion system 2508/2520 (including exhaust and scrubber unit) and Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The user of the instrument performs the PQ.

### 2 Intended Use

The Digestion system (including exhaust and scrubber) and Kjeltec 8100 Distillation Unit are intended for laboratory use analyzing parameters as specified in FOSS Application Notes.

### 3 Purpose

The guidelines are intended to assist the user in successfully developing Performance Qualifications for the specific application(s) to which the instrument is applied.

The Performance Qualification (PQ) includes the process of demonstrating that the Digestion system 2508/2520 (including exhaust and scrubber unit) and the Kjeltec 8100 Distillation unit consistently perform according to a specification appropriate for its routine use. Main activities in the PQ phase are:

- Preventive maintenance
- On-going verification tests

This document suggests routines to fulfill the requirements for an acceptable PQ but the final procedure should be adapted to local routines for similar equipment.

### 4 Definition of Test Procedures

#### 4.1 Preventive Maintenance

Maintenance of the Kjeltec 8100 should be performed according to the instructions in manual, see User Manual Kjeltec 8100/8200 Distillation Unit, chapter 5. Maintenance. A yearly service is recommended (service agreement).

Maintenance of the Digestion block (including exhaust and scrubber) should be performed according to instruction in the user manual, see User Manual Tecator Digestor, chapter 5. Maintenance.

#### Dedicated Analytical Solutions

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Web: www.foss.se

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## 4.2 Ongoing Qualification Tests

### Block Temperature

The temperature for the digestion is limited by the boiling point of the sulphuric acid, this can be increased by adding a salt ( $K_2SO_4$ ) to the digestion mixture. It's important that the optimal ratio between acid and salt is kept; please follow recommendation in AN 300 or suggested procedures for a specific kind of sample material.

The block temperature itself can be controlled external by inserting a temperature probe in the intended hole in the aluminium block (front row of holes).

Use the reagents and method procedure specified in AN 300. Use only reagents of recognized analytical grade, unless otherwise specified and distilled or demineralised water or water of equivalent purity.

*Suggested standard material for internal quality control:*

Ammonium sulphate  $[(NH_4)_2SO_4]$ , min. 99.5 % (mass fraction), with certified purity.

**Note: The above chemical is usually readily available with a certificate specifying the purity.**

Alternatively ammonium iron(II) sulphate,  $(NH_4)_2 Fe (SO_4)_2 \cdot x H_2O$ , with certified purity may be used.

Tryptophan ( $C_{11}H_{12}N_2O_2$ ), minimum assay 99 % (mass fraction). Nitrogen content 137.2 g/kg. Do not dry in an oven before use.

Acetanilide ( $C_8H_9NO$ ), minimum assay 99 % (mass fraction). Nitrogen content 103.6 g/kg. Do not dry in an oven before use.

Sucrose, ( $C_{12}H_{22}O_{11}$ ), with a nitrogen content of not more than 0.002 % (mass fraction). Do not dry in an oven before use.

### Blank Tests

Carry out a blank test following the currently used procedure for digestion, distillation and titration taking 2 ml of water and about 0.7 g of sucrose instead of the test portion. Keep a record of blank values. If blank values change, identify the cause.

**Note: The amount of titrant used in the blank test should always be greater than 0.0 ml. Blanks within the same laboratory should be consistent across time.**

## 4.3 Recovery Tests

Regularly run recovery studies to check the accuracy of procedure and equipment:

- **Nitrogen loss.** - Use 0.12 g ammonium sulphate and 0.67 g sucrose per flask weighted to the nearest 0.1 mg. Add all other reagents as stated in the method currently used (Kjeltabs,  $H_2SO_4$ , etc). Digest and distil under same conditions as for sample. Recoveries shall be >99 %.
- **Digestion efficiency.** - Use a test portion of minimum 0.15 g of tryptophan or acetanilide and 0.67 g sucrose per flask weighed to the nearest 0.1 mg. Determine the nitrogen content according to the current procedure in use. The recoveries of tryptophan shall be >98.5 %; the recoveries of acetanilide shall be >99.5 %.
- **Distillation and titration efficiency.** - Distil 0.10 - 0.15 g  $\pm 0.0001$  g ammonium sulphate, omitting the digestion step. The recoveries should be >99.5 %.

**Note: Results less than 98.5 % or more than 101.0 % in either of the recovery tests indicate failures in the procedure and/or inaccurate concentration of the standard volumetric hydrochloric acid solution (should be adjusted to four decimals accuracy according to procedure in AN 300)**

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## External Quality Control Program

It is recommended to participate in an external quality control program, such as a proficiency program or ring test, with equivalent sample material as analysed within the laboratory.

## Calculation and Expression of Results

$$W_N = \frac{14,007(V_s - V_b)N \times 100\%}{m}$$

Where:

$W_N$  is the nitrogen content of the sample, expressed as a percentage by mass.

$V_s$  is the numerical value of the volume of the hydrochloric acid standard volumetric solution) used in the sample test, in milliliters, expressed to the nearest 0.05 ml.

$V_b$  is the numerical value of the volume of the hydrochloric acid standard volumetric solution used in the blank test, in milliliters, expressed to the nearest 0.05 ml.

$N$  is the numerical value of the exact normality of the hydrochloric acid standard volumetric solution, expressed to four decimal places.

$m$  is the numerical value of the mass of the test portion, in milligrams, expressed to the nearest 1 mg for sample weights >1 g or to the nearest 0.1 mg for sample weights <1 g.

## 5 Maintenance

### 5.1 Maintenance Kjeltec™ 8100

See instructions in User Manual - Kjeltec 8100/8200, chapter 5 Maintenance.

### 5.2 Maintenance Tecator™ Digestor

See instructions in User Manual - Tecator Digestor, chapter 5 Maintenance.

## 6 The Maintenance Record Charts

This record charts are provided to assist you in keeping your system in good working order. Please make copies and use them regularly as they can often help us to help you in the unlikely event a system malfunction.

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## 6.2 FossCare™ Customer Log

### 6.2.1 Daily Maintenance

[illegible]

## เอกสารไม่ควบคุม

### 6.2.2 Weekly Maintenance

[illegible]

## เอกสารไม่ควบคุม

## 6.1 FossCare™ Service Log

[illegible]

Applicable for FOSS sales and service companies.

[illegible]

<sup>1</sup>Applicable for FOSS sales and service companies.

### 6.2.5 Yearly Maintenance

[illegible]

## เอกสารไม่ควบคุม

### 6.2.3 Every 1-3 Months Maintenance

[illegible]

## เอกสารไม่ควบคุม

### 6.2.6 Exchange of Parts and Reagents Maintenance

[illegible]

## เอกสารไม่ควบคุม

#### 6.2.4 Additional Maintenance

[illegible]

## เอกสารไม่ควบคุม



## Certificate of System Qualification

GC-OQ

System ID: CN11021007  
Organization Name: UAE Consultant Co., Ltd.  
Organization Location: 3 Sou Udomsuk 41, Sukhumvit Rd., Bangkok, Prakanong, Bangkok 10260.  
Date: February 10, 2021 10:36:27 AM  
EQP Name: Agilent/Recommended  
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: -0.3 psi / 5 minutes  
Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$

## Overall Inlet Pressure Decay Test Status

Pass

## Inlet Pressure Accuracy

Name: 7890  
Front SSL

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System ID: CN11021007

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Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 24.7 psi  
Accuracy: 0.3 psi  
Agilent Recommended:  $\leq 1.2$

## 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: 28.9 mL/min  
Accuracy: 1.1 mL/min  
Agilent Recommended:  $\leq 10.0$  % 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: 387.3 mL/min  
Accuracy: 12.7 mL/min  
Agilent Recommended:  $\leq 10.0$  % 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: 24.6 mL/min  
Accuracy: 0.4 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

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## 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: 24.7 mL/min  
Accuracy: 0.3 mL/min  
Agilent Recommended:  $\leq 10.0$  % 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: 230.0 228.6 °C  
Accuracy: -1.4 °C  
Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -5.0 °C )  
 $\leq 1.0$  % setpoint in K ( 5.0 °C )  
Setpoint Status: Pass  
Zone: Oven  
Setpoint/Actual  
Temperature: 100.0 99.6 °C  
Accuracy: -0.4 °C  
Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -3.7 °C )  
 $\leq 1.0$  % setpoint in K ( 3.7 °C )

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## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name: 7890  
Setpoint Status: Pass  
Setpoint/Average  
Temperature: 100.0 99.58333 °C  
Stability: 0.2 °C  
Agilent Recommended:  $\leq 0.5$

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1 Front SSL / Back FID  
Injection Tower  
Name: 7890

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1 Front SSL / Back FID  
Name: 7890

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Setpoint Status: Pass

Base Signal: 13.7 pA

ASTM Noise	Drift
pA	pA/hr
0.03	1.44
0.10	2.50

Agilent Recommended: <= 0.10 <= 2.50

Status: Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1: Front SSL / Back FID

Name: 7683B

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 1.05 % Retention Time RSD: 0.10 %

Agilent Recommended: <= 3.00 <= 1.00

This test's 0 comment(s) and 1 deviation(s) are available in the Attachments section.

## 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: 656194

Agilent Recommended: >= 300000

## Overall Signal to Noise Test Status

Pass

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## Scouting Run

Tested Combination2: Front SSL / Front UECD

Manual Injection

Name: Not applicable

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination2: Front SSL / Front UECD

Name: 7890

Setpoint Status: Pass

Base Signal: 230 Hz

ASTM Noise	Drift
Hz	Hz/hr
1.87	1.71
3.00	15.00

Agilent Recommended: <= 3.00 <= 15.00

Status: Pass

This test's 0 comment(s) and 1 deviation(s) are available in the Attachments section.

## Overall Noise and Drift Test Status

Pass

## Signal to Noise

Tested Combination2: Front SSL / Front UECD

Manual Injection

Name: 7890

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Setpoint Status: Pass

Signal to Noise: 9364

Agilent Recommended: >= 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	CN11021007
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	Manual Injection
Inlet	Front
Detector	Front
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7683B
Model Number	G2913A
Serial Number	CN82149435
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Front
Syringe Volume (uL)	10

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Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7663A
Model Number	G2614A
Serial Number	CN82248787
Firmware Revision	A.02.01

Sampler 3	
Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	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

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Detector 1	
Manufacturer	Agilent Technologies
Name	7890
Type	UECD
Serial Number	U16886
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2	
Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

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## Electronic Signature

### Purpose

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### Details

Full Name of Signer: Kasemchai Suwansuksiri  
Logged On User Name: Kasemchai.Suwansuksiri@mon.agilent.com  
Signature Creation Date: February 10, 2021  
Reason for Signature: Executed protocol and published this original version of document.

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User Name: kasemchai.suwansuksiri

Hostname: LAPTOP-H10G878L

System ID: CN11021007

Print Date: February 10, 2021 10:36:27 AM

OQHW\_CN11021007\_UAE Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 11:54:42 AM	Audit	SessionCreated	Session	None
February 9, 2021 11:54:43 AM	Start	Configuration	Session	None
February 9, 2021 11:54:43 AM	Audit	Enrollment	Licensing	User is Nonpaying and does not require an unlock code
February 9, 2021 11:59:21 AM	Audit	ExpLoaded	Session	EOP details for primary technique (Sc) - File path: [Phone\Public\100\Configurations\G2.51\Gc.02.01.asp] EOP File Name: [Gc.02.01.asp], EOP Name: [AgilentRecommended]
February 9, 2021 12:00:02 PM	End	Configuration	Session	None
February 9, 2021 12:00:07 PM	Start	Qualification	Session	OQ
February 9, 2021 12:00:08 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test: No sequents associated	None
February 9, 2021 12:00:29 PM	End	Qualification	Session	OQ
February 9, 2021 12:00:29 PM	Start	Reporting	Session	None
February 9, 2021 12:02:32 PM	End	Reporting	Session	None
February 9, 2021 12:02:32 PM	Start	Qualification	Session	OQ

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System ID: CN11021007

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User Name: kasemchai.suwansaokulit System ID: CN11021997  
 Hostname: LAPTOP-110SG7SL Print Date: February 10, 2021 10:36:31 AM

QGMW\_CN11021997\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 12:02:32 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	None
February 9, 2021 12:07:51 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	Run Count: 1
February 9, 2021 12:07:03 PM	Start	Execution	Intel Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 9.5 psi	None
February 9, 2021 12:07:12 PM	End	Execution	Intel Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 9.5 psi	Run Count: 1
February 9, 2021 12:07:13 PM	Start	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
February 9, 2021 12:07:17 PM	End	Execution	Intel Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
February 9, 2021 12:07:18 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
February 9, 2021 12:08:36 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
February 9, 2021 12:08:38 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1

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 System ID: CN11021007

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User Name: kasemchai.suwansaokulit System ID: CN11021997  
 Hostname: LAPTOP-110SG7SL Print Date: February 10, 2021 10:36:31 AM

QGMW\_CN11021997\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 12:08:40 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
February 9, 2021 12:08:53 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
February 9, 2021 12:08:54 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
February 9, 2021 12:08:55 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
February 9, 2021 12:09:09 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
February 9, 2021 12:09:10 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
February 9, 2021 12:09:12 PM	Start	Execution	Detector Flow Accuracy - Front UCCD - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
February 9, 2021 12:09:31 PM	Audit	Data	Detector Flow Accuracy - Front UCCD - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
February 9, 2021 12:09:33 PM	End	Execution	Detector Flow Accuracy - Front UCCD - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1

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User Name: kasemchai.suwansaokulit System ID: CN11021007  
 Hostname: LAPTOP-110SG7SL Print Date: February 10, 2021 10:36:31 AM

QGMW\_CN11021997\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 12:09:34 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 235.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 9, 2021 12:10:04 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 235.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
February 9, 2021 12:10:05 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 235.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
February 9, 2021 12:10:06 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 190.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 9, 2021 12:10:29 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 190.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
February 9, 2021 12:10:31 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature : Oven - S: 190.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
February 9, 2021 12:10:33 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 190.0°C - L: <= 0.5°C	None
February 9, 2021 12:11:09 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 190.0°C - L: <= 0.5°C	Manual Data Entry
February 9, 2021 12:11:07 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature : Oven - S: 190.0°C - L: <= 0.5°C	Run Count: 1

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User Name: kasemchai.suwansaokulit System ID: CN11021007  
 Hostname: LAPTOP-110SG7SL Print Date: February 10, 2021 10:36:31 AM

QGMW\_CN11021997\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 12:11:34 PM	Audit	AcqClosed	Session	None
February 9, 2021 1:01:14 PM	Audit	AcqRestarted	Session	None
February 9, 2021 1:01:16 PM	Audit	SessionReloaded	Session	None
February 9, 2021 1:01:19 PM	Start	Qualification	Session	QC
February 9, 2021 1:06:31 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Back FID - Part of System Preparation - No limits associated	None
February 9, 2021 1:06:46 PM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Back FID - Part of System Preparation - No limits associated	Data File Path: E:\QIPV\2021_CN11021007_UAE\GC_FID\QIPV2021.d
February 9, 2021 1:07:18 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Back FID - Part of System Preparation - No limits associated	Run Count: 1
February 9, 2021 1:07:22 PM	Start	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	None
February 9, 2021 1:07:32 PM	Audit	Data	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Data File Path: E:\QIPV\2021_CN11021007_UAE\NOISE_FID\QIPV2021.d
February 9, 2021 1:07:40 PM	End	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Run Count: 1

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User Name: kasemchai.suwansaakul		System ID: CN11021007	
Host Name: LAPTOP-110SG7SL		Print Date: February 10, 2021 10:36:31 AM	
OQHW_CN11021007_UAE Transaction log:			
Time	Transaction State	Activity Performed	Optional Information
February 9, 2021 1:07:45 PM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID2.D\FID208.ch
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID3.D\FID208.ch
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID4.D\FID208.ch
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID5.D\FID208.ch
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID6.D\FID208.ch
February 9, 2021 1:08:00 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID7.D\FID208.ch
February 9, 2021 1:08:03 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00% Run Count: 1

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User Name: kasemchai.suwansaakul

System ID: CN11021007

Host Name: LAPTOP-110SG7SL

Print Date: February 10, 2021 10:36:31 AM

OQHW\_CN11021007\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 1:08:00 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Back FID - Detector FID - L >= 300000	None
February 9, 2021 1:08:33 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Back FID - Detector FID - L >= 300000	None
February 9, 2021 1:08:48 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Back FID - Detector FID - L >= 300000	Data file Path: E:\OQPV2021_CN11021007\_UAE\SN_FID.D\FID208.ch
February 9, 2021 1:09:58 PM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Back FID - Detector FID - L >= 300000	Run Count: 1
February 9, 2021 1:21:48 PM	Audit	TestUnlocked	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Deviation filed for Run Count: 1
February 9, 2021 1:21:48 PM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	None
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID2.D\FID208.ch
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID3.D\FID208.ch
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID4.D\FID208.ch

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User Name: kasemchai.suwansaakul

System ID: CN11021007

Host Name: LAPTOP-110SG7SL

Print Date: February 10, 2021 10:36:31 AM

OQHW\_CN11021007\_UAE Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID5.D\FID208.ch
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID6.D\FID208.ch
February 9, 2021 1:25:42 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Data file Path: E:\OQPV2021_CN11021007\_UAE\IP_FID7.D\FID208.ch
February 9, 2021 1:25:45 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Back FID - GC - L (Area) <= 3.00% - L (Ref. Time) <= 1.00%	Run Count: 2
February 9, 2021 1:37:02 PM	Audit	AccClosed	Session	None
February 9, 2021 1:42:31 PM	Audit	AccRestarted	Session	None
February 9, 2021 1:42:32 PM	Audit	SessionReloaded	Session	None
February 9, 2021 1:42:34 PM	Start	Qualification	Session	OQ
February 9, 2021 1:43:18 PM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front UECD - Detector UECD - L >= 1500	None
February 9, 2021 1:45:10 PM	Start	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Halfhour	None

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Date: February 10, 2021 10:36:27 AM  
System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: kasemchai.suwansaakul		System ID: CN11021007	
Host Name: LAPTOP-110SG7SL		Print Date: February 10, 2021 10:36:31 AM	
OQHW_CN11021007_UAE Transaction log :			
Time	Transaction State	Activity Performed	Optional Information
February 9, 2021 1:50:43 PM	Audit	AccClosed	Session
February 10, 2021 10:27:02 AM	Audit	AccRestarted	Session
February 10, 2021 10:27:03 AM	Audit	SessionReloaded	Session
February 10, 2021 10:27:11 AM	Start	Qualification	Session
February 10, 2021 10:27:11 AM	Start	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Halfhour
February 10, 2021 10:27:33 AM	Start	Execution	GC Scouting Run - Manual Injection, Front SSL, Front UECD - Part of System Preparation - No limits associated
February 10, 2021 10:27:36 AM	Audit	Data	GC Scouting Run - Manual Injection, Front SSL, Front UECD - Part of System Preparation - No limits associated Data file Path : E:\OQPV2021_CN11021007\_UAE\GC_UECD1.D\UECD1A.ch
February 10, 2021 10:28:19 AM	End	Execution	GC Scouting Run - Manual Injection, Front SSL, Front UECD - Part of System Preparation - No limits associated Run Count: 1
February 10, 2021 10:28:21 AM	Start	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Halfhour

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Date: February 10, 2021 10:36:27 AM  
System ID: CN11021007

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เอกสารไม่ควบคุม

User Name: kasemchai.kumarnakorn		System ID: CN11021007		
Host Name: LAPTOP-110B076L		Print Date: February 10, 2021 10:36:31 AM		
OQIW_CN11021007_UAE Transaction Log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 10, 2021 10:28:38 AM	Auto	Data	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	Data File Path: E:\OQPV2021_CN11021007_UAE\NOISE-UECD.D\ECDA1A.ch
February 10, 2021 10:28:44 AM	End	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	Run Count: 1
February 10, 2021 10:29:50 AM	Start	Execution	Signal to Noise - Manual Injection, Front SSL, Front UECD - Detector UECD - L <= 1500	None
February 10, 2021 10:29:11 AM	Auto	Data	Signal to Noise - Manual Injection, Front SSL, Front UECD - Detector UECD - L <= 1500	Data File Path: E:\OQPV2021_CN11021007_UAE\SN-UECD.D\ECDA1A.ch
February 10, 2021 10:29:18 AM	End	Execution	Signal to Noise - Manual Injection, Front SSL, Front UECD - Detector UECD - L <= 1500	Run Count: 1
February 10, 2021 10:30:17 AM	Auto	Test/Unlocked	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	Deviation Std for Run Count
February 10, 2021 10:30:17 AM	Start	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	None
February 10, 2021 10:30:28 AM	Auto	Data	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	Data File Path: E:\OQPV2021_CN11021007_UAE\NOISE-UECD.D\ECDA1A.ch

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User Name: kasemchai.kumarnakorn

Host Name: LAPTOP-110B076L

System ID: CN11021007

Print Date: February 10, 2021 10:36:31 AM

OQIW\_CN11021007\_UAE Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 10, 2021 10:30:32 AM	End	Execution	Noise and Drift - Front UECD - Detector UECD - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	Run Count: 2
February 10, 2021 10:30:35 AM	End	Qualification	Session	OQ
February 10, 2021 10:30:35 AM	Start	Reporting	Session	None
February 10, 2021 10:35:59 AM	Auto	Reporting	Session	Report Generated : Certificate

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Date: February 10, 2021 10:36:27 AM  
System ID: CN11021007

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เอกสารไม่ควบคุม

Date: February 10, 2021 10:36:27 AM  
System ID: CN11021007

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เอกสารไม่ควบคุม

Agilent CrossLab Compliance Services	
EQUIPMENT QUALIFICATION REPORT (EQR)	
Agilent CrossLab Compliance	
Qualification Type	OQ-03
System ID	CN11021007
EQP Name	Agilent 86000
EQP Details	Agilent Technologies System
EQP Version	02.03.01
EQP Release Date	November 2009
Date	February 10, 2021 10:37:30 AM
Report Type	Report
Org Name	UAE CONSULTING CO., LTD.
Org Location	3 Bua Udomsil 41, Subhansil Rd., Bangkok, Thailand 10250

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Section	Page
Front	1
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Test Summary	4
Service Details	6
Instrument Details	8
Calculation Formulas	11
Test	12
System Inspection and Basic Safety and Operation - 1000	12
Initial Pressure Check - Front SSL	13
Initial Pressure Accuracy - Front SSL	14
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Detector Flow Accuracy - Front UECD	17
O2 Oven Temperature Accuracy - 1000	18
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System ID: CN11021007

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Service Details	
Purpose	
This section includes test control and delivery details for this service.	
Sample Details	
Service Order No./Phase	02041001
EQP Name	Agilent 86000
EQP Version	02.03.01
Report Type	Report
Organization Details	
Name	UAE CONSULTING CO., LTD.
Location	3 Bua Udomsil 41, Subhansil Rd., Bangkok, Thailand 10250
Local Contact Details	
Name	Wassana Petchsophon
Job Title	Chemist
Qualification Location	Instrument Room
Operator Details	
Name	Wassana Petchsophon
Job Title	Field Service Engineer
Basic Application Details	
Integration Software Name	ChemStation
Integration Software Version	8.04.02
Customer Data System (CDS)	GC ChemStation

Date: February 10, 2021 10:37:30 AM  
System ID: CN11021007

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Instrument Details	
Purpose	
This section describes the on-board system configuration.	
Sample	
System	
System ID	CN11021007
Manufacturer	Agilent Technologies
Name	7890
New Data Input	Manual Data
Injection Data Input	Manual Data or Other Data Logging
Tested Component	
Injection Technique	Injection Taper
Injection	Front
Detector	Back
Tested Component	
Injection Technique	Manual Injection
Injection	Front
Detector	Front
Tested Component	
Manufacturer	Agilent Technologies
Type	Injection Taper
Name	7890
Model Number	86010A
Serial Number	040214048
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10

Date: February 10, 2021 10:37:30 AM  
System ID: CN11021007

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-GC - L (Noise) <= 3.00 Hz - L (Drift) <= 15.00 Hz	49
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Test Summary	
Purpose	
This section includes a table for each individual test and the overall qualification. The table has three rows: (1) the status of the test, (2) the test results, and (3) the test results. The test results are the test results for the test results and the test results for the test results.	
Details	
Test	Status
System Inspection and Basic Safety and Operation - 1000	Pass
Initial Pressure Check - Front SSL	Pass
Initial Pressure Accuracy - Front SSL	Pass
Detector Flow Accuracy - Back FID	Pass
Detector Flow Accuracy - Front UECD	Pass
O2 Oven Temperature Accuracy - 1000	Pass
O2 Oven Temperature Stability - 1000	Pass
O2 Flowing Run - Injection Taper, Front SSL, Back FID	Pass
Noise and Drift - Back FID	Pass
Injection Precision - Injection Taper, Front SSL, Back FID	Pass
Signal-to-Noise - Injection Taper, Front SSL, Back FID	Pass
O2 Flowing Run - Manual Injection, Front SSL, Front UECD	Pass
Noise and Drift - Front UECD	Pass
Signal-to-Noise - Manual Injection, Front SSL, Front UECD	Pass
Overall Qualification Status	
Pass	

Date: February 10, 2021 10:37:30 AM  
System ID: CN11021007

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Sample 2	
Manufacturer	Agilent Technologies
Type	7890
Name	7890
Model Number	86010A
Serial Number	040214048
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10
Sample 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	86010A
Serial Number	CN11021007
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10
Sample 1	
Manufacturer	Agilent Technologies
Name	7890
Type	7890
Model Number	86010A
Serial Number	CN11021007
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10

Date: February 10, 2021 10:37:30 AM  
System ID: CN11021007

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Detector 1	
Manufacturer	Agilent Technologies
Name	7890
Type	7890
Model Number	86010A
Serial Number	040214048
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10
Detector 2	
Manufacturer	Agilent Technologies
Name	7890
Type	7890
Model Number	86010A
Serial Number	CN11021007
Pressure Regulation	A.11.05
Sample Injection	Sample Injection
Front	Front
Sample Volume (µL)	10

Date: February 10, 2021 10:37:30 AM  
System ID: CN11021007

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[illegible][illegible][illegible]

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Aspiration operator: **ASPMQC\_F01M**

Aspiration method: **P\_2100.0**

Draw rate indicated for this test: **0.9446 L/min**

Aspiration Date: **09-Feb-15 13:21:11**

ASPMQC\_F01M

P\_2100.0

Aspiration operator: **ASPMQC\_F01M**

Aspiration method: **P\_2100.0**

Draw rate indicated for this test: **0.9446 L/min**

Aspiration Date: **09-Feb-15 13:21:11**

ASPMQC\_F01M

P\_2100.0

Date: **February 10, 2015 13:27:00 AM**

System ID: **200701001**

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[illegible]

Sample to Analyze: **Amalgams**      Report: **Final Report: Amalgams**

Acquisition Method: **Acquisition (SPECT)**

Integration Method: **INTEGRATE\_2.F12**

File Path: **\\JCDC\B**

Acquisition Date: **09-Feb-01, 13:55:42**

Integration Parameters:

Type of Integration:	Integration
Integration Count:	0
Integration Values:	
Baseline Correction Mode:	Advanced
Initial Slope Sensitivity:	1.0
Initial Peak Width:	0.0
Initial Area Weight:	0
Initial Weight Percent:	100
Search Speed Factor:	

Integration Type	Value	Time
Integration	299	0
Integration	284	0.93
Integration	437	0.9

8000 by Agilent Technologies

Acquisition speed: 10000  
Acquisition method: ExpMSDC\_110.M  
Data file added for this test: PL\_P107.D  
Acquisition time: 04-May-11 13:14:15

Peak list (m/z, relative intensity)

m/z	Relative Intensity
554.1	100.0
555.1	10.0

The NIST® compound library® identifiers are available in the Agilent MSD chem. browser.

Downloaded from Agilent Product Database

File:

[illegible][illegible]

Report by Agent Technology

Acquisition period: 30/Feb/2012 12:51:18

Acquisition method: 30/Feb/2012

Data file analyzed by this tool: 30/Feb/2012

Acquisition Date: 30/Feb/2012 12:51:18

Integration Settings

Type of Integration	Integration
Integration Count	0

General Values

Baseline Correction Mode	Reference
Initial Slope Sensitivity	1.0
Initial Peak Width	0.01
Initial Area Weight	0
Initial Height Report	100

Towed Event Times

Integration Type	Value	Time
Integration	OFF	0
Integration	OFF	0.15
Integration	OFF	0.5

Application location	
Application method	BCD75B0_16ED0E
Data file included in this tool	IC_00C11D
Installation Date	28/04/21 11:48:21
<b>Integration Parameters:</b>	
Type of Integration	Integration
Integration Court	5
Contract Name	
Business Connection Mode	Advanced
Initial Stage Granularity	51
Initial Peak Width	0.01
Initial Status Report	0
Initial Message Queue	100
Timeout Event Types	
Integration Type	Value
Integration	QIP
Integration	QIP
Integration	QIP

GC-MS Chromatogram showing Intensity vs. Time (min). The x-axis ranges from 0 to 100 minutes, and the y-axis ranges from 0 to 1,000,000 intensity units. A significant peak is observed at approximately 60 minutes, labeled with retention time 7.044 (6), abundance 1.00E+06 (6), and a value of 6.79E-03 (2).

[illegible]

## Scouting Run

2020 to Apache Technologies

Agent installed successfully

Progress

This tool is used to determine the characteristics for presence of expected packets, sufficient run time, and proper integration overall prior to the start of the exploitation cycle.

Sequence

The sequence below will perform a single step of the evaluation standard.

Evaluation standard: 1. Update

Configuration Details

Host	SSL	1 Port	2020
Method/Operation			
Name	Not applicable		

Sequence

Sequence runs on Ubuntu

1.0

2.0

3.0

4.0

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[illegible]

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Agilent Controller Compliance Document

Find name: LAPTOP-V000000L

Original Data Path: \\G04P00221\_C01\\101001\_LINE

Analysis Data Path: F:\AGS3\_1\Agilent\_AGS3\awc\compliance\compliance\G04P00221\_C01\101001\_LINE\AGS3\NewData\_1\000001\_1\_0\_1\NewSourceRun1

---

Issue: February 10, 2024 10:01 AM PST

System ID: C01101007

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[illegible]

**Subjects**

- Subjects: N=24
- Age: mean 22.5, range 18-30
- Gender: 12 M, 12 F
- Education: all university students

**Design**

2x2x2 factorial design

- Task: Easy, Hard
- Group: Control, Experimental
- Time: Pre, Post

**Data analysis**

- Statistical tests: ANOVA, t-test, post-hoc
- Significance level:  $p < 0.05$

[illegible]

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Acquisition operation  
Acquisition method: SPECTRAL\_WCSD M  
Data file analyzed for this test: SDR\_WCSD  
Acquisition Date: 05 Feb 01 12:27:00

Amplitude

Frequency

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

0 10 20 30 40 50 60 70 80 90 100

Overall Signal to Noise: Test Station

Area:

Date: February 14, 2001 10:03:06 AM  
System ID: 0011031007

เอกสารไม่ควบคุม

[illegible][illegible]

**Chromatogram 1 (Top):**

- Compound Name: N,N'-bis(4-methylphenyl)-N,N'-diphenyl-1,4-bis(4-methylphenyl)-1,4-diazapentadiene
- Retention Time: 10.501 min
- Peak Label: 10.501

**Chromatogram 2 (Bottom):**

- Compound Name: N,N'-bis(4-methylphenyl)-N,N'-diphenyl-1,4-bis(4-methylphenyl)-1,4-diazapentadiene
- Retention Time: 10.501 min
- Peak Label: 10.501

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Agilent Technologies Transposable Elements

Instrument: Agilent 1100  
 Acquisition Method: MS\_2009\_01  
 Data File: C:\msd1\data\MS\_2009\_01\MS\_2009\_01.D  
 Acquisition File: MS\_2009\_01\_01.D

Abundance

Time (min)

16.021 min

Transposable Element Peak Data

Peak	Retention Time (min)	Abundance
1	16.021	~1000000

File: MS\_2009\_01\_01.D

Page 1 of 1

# Declaration of Change Control

The document is called *change control*. Another name is *configuration* and *control* or *change*. *configuration* is the master documents is linked to process names. Document master records names and cannot be assigned an *assignment status*. This qualification performs according to the document when only in the *master-document* configuration it is at the end of the configuration. *Agilent Technologies* recommends the *instrument configuration change management* procedure to reduce or solve the customer's problem. My change in the analyzer or sample software or software that the client controls. A change management system provides a means for determining the degree of classification required according to the extent of the change made. All details of the changes must be thoroughly recorded and documented together with details of completed tests and their results. Also, *hardware/software configuration management* is the customer's responsibility.

---

Issue: February 10, 2014 10:17 AM  
Revision 01: 09/10/2017

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ESSE for Applied Technologies			Highly Detailed Completion Summary
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EGR	Detection	Wastewater Permit - Hudson River, Part III, Block IV, SEC - L, 79 Hazardous Waste Site ID# = 1485.	76
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[illegible][illegible][illegible][illegible]





Document Name: Certificate of Calibration Transducer

Date: February 15, 2021 10:17:36 AM  
System ID: CM-1021027

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Document Name: Certificate of Calibration Transducer

Date: February 15, 2021 10:17:36 AM  
System ID: CM-1021027

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Document Name: Certificate of Analysis ESD-62146, 10113-00406

Date: February 15, 2021 10:17:36 AM  
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Document Name: Certificate of Analysis P10 MSL, 62146, 10113-00406

Date: February 15, 2021 10:17:36 AM  
System ID: CM-1021027

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Document Name: Certificate of Analysis ESD-62146, 10113-00406

Date: February 15, 2021 10:17:36 AM  
System ID: CM-1021027

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Document Name: Certificate of Calibration Transducer

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Document Name: Certificate of Calibration Transducer

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Date: February 15, 2021 10:17:36 AM  
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Use Name: [Redacted] System ID: [Redacted]  
 Revision: [Redacted] Date: [Redacted]

Test	Transducer	Activity	Pressure	Agilent Recommended
Pressure 1 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 2 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 3 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 4 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 5 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 6 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 7 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 8 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 9 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 10 (201-10000) psi	201-10000	Pressure	201-10000	201-10000

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Use Name: [Redacted] System ID: [Redacted]  
 Revision: [Redacted] Date: [Redacted]

Test	Transducer	Activity	Pressure	Agilent Recommended
Pressure 1 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 2 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 3 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 4 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 5 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 6 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 7 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 8 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 9 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 10 (201-10000) psi	201-10000	Pressure	201-10000	201-10000

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Use Name: [Redacted] System ID: [Redacted]  
 Revision: [Redacted] Date: [Redacted]

Test	Transducer	Activity	Pressure	Agilent Recommended
Pressure 1 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 2 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 3 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 4 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 5 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 6 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 7 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 8 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 9 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 10 (201-10000) psi	201-10000	Pressure	201-10000	201-10000

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Use Name: [Redacted] System ID: [Redacted]  
 Revision: [Redacted] Date: [Redacted]

Test	Transducer	Activity	Pressure	Agilent Recommended
Pressure 1 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 2 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 3 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 4 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 5 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 6 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 7 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 8 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 9 (201-10000) psi	201-10000	Pressure	201-10000	201-10000
Pressure 10 (201-10000) psi	201-10000	Pressure	201-10000	201-10000

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## Certificate of System Qualification

GC-0Q

System ID: CN13113001  
 Organization Name: United Analyst and Engineering Consultant  
 Organization Location: 3 Soi Udomsuk 41 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10200

Date: April 22, 2022 2:32:15 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: April 22, 2022 2:32:15 PM  
 System ID: CN13113001

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Setpoint Status: Pass

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

### Overall Inlet Pressure Accuracy Test Status

Pass

#### Detector Flow Accuracy

Name: 7890  
 Back FPD+

Setpoint Status: Pass

Flow Type: Fuel  
 Setpoint: 60.0 mL/min  
 Measured Flow: 60.2 mL/min  
 Accuracy: 0.2 mL/min  
 Agilent Recommended: <= 10.0 % setpoint ( 6.0 mL/min )  
 Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer  
 Setpoint: 60.0 mL/min  
 Measured Flow: 60.1 mL/min  
 Accuracy: 0.1 mL/min  
 Agilent Recommended: <= 10.0 % setpoint ( 6.0 mL/min )  
 Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup  
 Setpoint: 60.0 mL/min  
 Measured Flow: 64.8 mL/min  
 Purge Offset: 20 % setpoint  
 Adjusted Setpoint: 72.00 mL/min  
 Accuracy: 7.2 mL/min  
 Agilent Recommended: <= 10.0 % setpoint ( 7.2 mL/min )  
 Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

### Overall Detector Flow Accuracy Test Status

Pass

#### Detector Flow Accuracy

Name: 7890  
 Front FID

Setpoint Status: Pass

Flow Type: Fuel  
 Setpoint: 30.0 mL/min  
 Measured Flow: 30.2 mL/min  
 Accuracy: 0.2 mL/min  
 Agilent Recommended: <= 10.0 % setpoint ( 3.0 mL/min )  
 Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer  
 Setpoint: 400.0 mL/min  
 Measured Flow: 398.2 mL/min  
 Accuracy: 1.8 mL/min  
 Agilent Recommended: <= 10.0 % setpoint ( 40.0 mL/min )  
 Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.



Setpoint Status: **Pass**

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 24.9 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )

Limit is percentage of setpoint or 0.5 minutes, whichever is largest.

## Overall Detector Flow Accuracy Test Status

Pass

## GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: **Pass**

Zone: Oven

Setpoint/Actual: 230.0 / 230.6 °C

Temperature: 230.0 230.6 °C

Accuracy: 0.6 °C

Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -5.0 °C )  
 $\leq 1.0$  % setpoint in K ( 5.0 °C )

Setpoint Status: **Pass**

Zone: Oven

Setpoint/Actual: 100.0 / 100.4 °C

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -3.7 °C )  
 $\leq 1.0$  % setpoint in K ( 3.7 °C )

## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name: 7890

Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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Setpoint Status: **Pass**

Setpoint/Average: 100.0 100.4333 °C

Temperature: 100.0 100.4333 °C

Stability: 0.1 °C

Agilent Recommended:  $\leq 0.5$

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1: Front SSL / Back FPD+

Name: 7893A

Setpoint Status: **Completed**

Injection Volume on Column: 1.0 uL

Mode: P-Mode

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1: Front SSL / Back FPD+

Name: 7890

Setpoint Status: **Pass**

Mode: P-Mode

Base Signal: 12.2 150 pA

ASTM Noise: 1.58

DU: 0.52

Agilent Recommended:  $\leq 2.00$

Status: Pass

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## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1: Front SSL / Back FPD+

Name: 7893A

Setpoint Status: **Pass**

Injection Volume on Column: 1.0 uL

Mode: P-Mode

Area RSD: 2.63 % Retention Time RSD: 0.02 %

Agilent Recommended:  $\leq 3.00$   $\leq 1.00$

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Tested Combination1: Front SSL / Back FPD+

Name: 7890

Mode: P-Mode

Setpoint Status: **Pass**

Signal to Noise: 11529

Agilent Recommended:  $\geq 2400$

## Overall Signal to Noise Test Status

Pass

## Scouting Run

Tested Combination2: Front SSL / Front FID

Name: 7893A

Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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Setpoint Status: **Completed**

Injection Volume on Column: 1.0 uL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination2: Front SSL / Front FID

Name: 7890

Setpoint Status: **Pass**

Base Signal: 21.3 pA

ASTM Noise: 0.07

pA/hr: 0.65

Agilent Recommended:  $\leq 0.10$

Status: Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination2: Front SSL / Front FID

Name: 7893A

Setpoint Status: **Pass**

Injection Volume on Column: 1.0 uL

Area RSD: 0.44 % Retention Time RSD: 0.24 %

Agilent Recommended:  $\leq 3.00$   $\leq 1.00$

## Overall Injection Precision Test Status

Pass

## Signal to Noise

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System ID: CN13113001

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Tested Combination2	Front	SSL	/ Front	FID
Injection Tower				
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	521845			
Agilent Recommended:	>= 300000			
Overall Signal to Noise Test Status				
Pass				

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System ID: CN13113001

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## Instrument Details

## Purpose

This section describes the as found system configuration.

## Details

## System

System ID	CN13113001
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	7893A
Model Number	G4513A
Serial Number	CN13260018
Firmware Revision	A.10.08
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

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System ID: CN13113001

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Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7893A
Model Number	G4514A
Serial Number	CN13200169
Firmware Revision	A.10.16
Vial Heater	Not installed
Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440B
Serial Number	CN13113001
Firmware Revision	B.02.03.2
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	Front
Makeup Gas	Nitrogen

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System ID: CN13113001

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## Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FPD+
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen
First Filter Tested	P-Mode

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System ID: CN13113001

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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: April 22, 2022  
Reason for Signature: Executed protocol and published this original version of document

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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User Name: saenguthai.tarak		System ID: CN13113001		
Host Name: LAPTOP-CQ3SK0BY		Print Date: April 22, 2022 2:32:15 PM		
CN13113001 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:34:25 AM	Audit	SessionCreated	Session	None
April 22, 2022 9:34:25 AM	Start	Configuration	Session	None
April 22, 2022 9:34:25 AM	Audit	EndSession	Licensing	User is Nonpaying and does not require an unlock code
April 22, 2022 9:34:51 AM	Audit	ExpLoaded	Session	EGP details for primary technique (N4) - File path: (Process)Packs\Gur\Configure\lone\G2.5\Gc.G2.51.asp; EGP File Name: (Gc.G2.51.asp); EGP Name: (AgilentRecommended)
April 22, 2022 9:34:54 AM	End	Configuration	Session	None
April 22, 2022 9:35:00 AM	Start	Qualification	Session	CO
April 22, 2022 9:35:00 AM	Start	Execution	System Inspection and Basic Safety and Operation - F890 - Qualitative Test - No subpoints associated	None
April 22, 2022 9:35:21 AM	End	Execution	System Inspection and Basic Safety and Operation - F890 - Qualitative Test - No subpoints associated	Run Count: 1
April 22, 2022 9:35:34 AM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	None
April 22, 2022 9:36:32 AM	End	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	Run Count: 1
April 22, 2022 9:36:38 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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User Name: saenguthai.tarak		System ID: CN13113001		
Host Name: LAPTOP-CQ3SK0BY		Print Date: April 22, 2022 2:32:15 PM		
CN13113001 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:35:39 AM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
April 22, 2022 9:36:42 AM	Start	Execution	Detector Flow Accuracy - Back FPD+ - Type: Fuel - S: 60.0 mL/min - L: <= 10.0% setpoint	None
April 22, 2022 9:36:01 AM	Audit	Data	Detector Flow Accuracy - Back FPD+ - Type: Fuel - S: 60.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 9:36:05 AM	End	Execution	Detector Flow Accuracy - Back FPD+ - Type: Fuel - S: 60.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
April 22, 2022 9:36:07 AM	Start	Execution	Detector Flow Accuracy - Back FPD+ - Type: Oxidizer - S: 60.0 mL/min - L: <= 10.0% setpoint	None
April 22, 2022 9:36:25 AM	Audit	Data	Detector Flow Accuracy - Back FPD+ - Type: Oxidizer - S: 60.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 9:36:33 AM	End	Execution	Detector Flow Accuracy - Back FPD+ - Type: Oxidizer - S: 60.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
April 22, 2022 9:36:35 AM	Start	Execution	Detector Flow Accuracy - Back FPD+ - Type: Makeup - S: 60.0 mL/min - L: <= 10.0% setpoint	None
April 22, 2022 9:37:09 AM	Start	Execution	Detector Flow Accuracy - Back FPD+ - Type: Makeup - S: 60.0 mL/min - L: <= 10.0% setpoint	None

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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User Name: saenguthai.tarak

Host Name: LAPTOP-CQ3SK0BY

System ID: CN13113001

Print Date: April 22, 2022 2:32:15 PM

CN13113001 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 9:37:33 AM	Audit	Data	Detector Flow Accuracy - Back FPD+ - Type: Makeup - S: 60.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 9:37:40 AM	End	Execution	Detector Flow Accuracy - Back FPD+ - Type: Makeup - S: 60.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
April 22, 2022 9:44:35 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Back FPD+ - Detector FPD+ - L: >= 2400	None
April 22, 2022 10:10:52 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Back FPD+ - Detector FPD+ - L: >= 2400	None
April 22, 2022 10:10:57 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
April 22, 2022 10:10:55 AM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 10:10:59 AM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
April 22, 2022 10:11:02 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
April 22, 2022 10:11:16 AM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 10:11:20 AM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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User Name: saengthai.tarak Hostname: LAPTOP-CQ38KQNV			System ID: CN13113001 Print Date: April 22, 2022 2:32:15 PM	
CN13113001 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:11:23 AM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 m/Link - L: <= 10.0% setpoint	None
April 22, 2022 10:11:40 AM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 m/Link - L: <= 10.0% setpoint	Manual Data Entry
April 22, 2022 10:11:48 AM	End	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 m/Link - L: <= 10.0% setpoint	Run Count: 1
April 22, 2022 10:11:52 AM	Start	Execution	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
April 22, 2022 10:12:16 AM	Audit	Data	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
April 22, 2022 10:12:18 AM	End	Execution	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
April 22, 2022 10:12:30 AM	Start	Execution	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
April 22, 2022 10:12:43 AM	Audit	Data	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
April 22, 2022 10:12:46 AM	End	Execution	GC Oven Temperature Accuracy: 7890 - Temperature Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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User Name: saengthai.tarak Hostname: LAPTOP-CQ38KQNV		System ID: CN13113001 Print Date: April 22, 2022 2:32:15 PM		
CN13113001 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:12:49 AM	Start	Execution	GC Oven Temperature Stability	None
- 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C				
April 22, 2022 10:13:43 AM	Audit	Data	GC Oven Temperature Stability	Manual Data Entry
- 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C				
April 22, 2022 10:13:45 AM	End	Execution	GC Oven Temperature Stability	Run Count: 1
- 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C				
April 22, 2022 10:13:50 AM	Start	Execution	GC Scouting Run - Injection	None
Tower, Front SSL, Back FPD - Part of System Preparation - No limits associated				
April 22, 2022 10:14:11 AM	Audit	Data	GC Scouting Run - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_SC001.D\FPD1B.ch
Part of System Preparation - No limits associated				
April 22, 2022 10:14:51 AM	End	Execution	GC Scouting Run - Injection	Run Count: 1
Tower, Front SSL, Back FPD - Part of System Preparation - No limits associated				
April 22, 2022 10:14:54 AM	Start	Execution	Noise and Drift - Back FPD -	None
Detector FPD - P-Mode - L (Noise) <= 2.00 100 pA - L (Drift) <= 1.50 100 pA/hour				
April 22, 2022 10:15:07 AM	Audit	Data	Noise and Drift - Back FPD -	Data File Path: Detector FPD - P-Mode - L (Noise) <= 2.00 100 pA - L (Drift) <= 1.50 100 pA/hour
Detector FPD - P-Mode - L (Noise) <= 2.00 100 pA - L (Drift) <= 1.50 100 pA/hour				
April 22, 2022 10:15:19 AM	End	Execution	Noise and Drift - Back FPD -	Run Count: 1
Detector FPD - P-Mode - L (Noise) <= 2.00 100 pA - L (Drift) <= 1.50 100 pA/hour				

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

เอกสารไม่ควบคุม

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User Name: saengthai.tarak Hostname: LAPTOP-CQ38KQNV		System ID: CN13113001 Print Date: April 22, 2022 2:32:15 PM		
CN13113001 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:15:23 AM	Start	Execution	Injection Precision - Injection	None
Tower, Front SSL, Back FPD - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%				
April 22, 2022 10:15:43 AM	Start	Execution	Injection Precision - Injection	None
Tower, Front SSL, Back FPD - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%				
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-008F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-007F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-008F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-008F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-010F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 10:16:06 AM	Audit	Data	Injection Precision - Injection	Data File Path: Tower, Front SSL, Back FPD - F:\FPD_Pre001-011F.D\FPD GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

เอกสารไม่ควบคุม

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User Name: saengthai.tarak

Hostname: LAPTOP-CQ38KQNV

System ID: CN13113001

Print Date: April 22, 2022 2:32:15 PM

CN13113001 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 10:16:23 AM	End	Execution	Injection Precision - Injection	Run Count: 1
Tower, Front SSL, Back FPD - GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%				
April 22, 2022 10:16:33 AM	Start	Execution	Signal to Noise - Injection	None
Tower, Front SSL, Back FPD - Detector FPD - L: >= 2400				
April 22, 2022 10:16:45 AM	Audit	Data	Signal to Noise - Injection	Data File Path: Tower, Front SSL, Back FPD - Detector FPD - L: >= 2400
Tower, Front SSL, Back FPD - Detector FPD - L: >= 2400				
April 22, 2022 10:16:51 AM	End	Execution	Signal to Noise - Injection	Run Count: 1
Tower, Front SSL, Back FPD - Detector FPD - L: >= 2400				
April 22, 2022 1:58:56 PM	Start	Execution	GC Scouting Run - Injection	None
Tower, Front SSL, Front FID - Part of System Preparation - No limits associated				
April 22, 2022 1:57:30 PM	Audit	Acquisition/Session	Session	None
April 22, 2022 1:57:32 PM	Audit	Session/Rebroadcast	Session	None
April 22, 2022 1:57:37 PM	Start	Qualification	Session	QC
April 22, 2022 1:57:37 PM	Start	Execution	GC Scouting Run - Injection	None
Tower, Front SSL, Front FID - Part of System Preparation - No limits associated				
April 22, 2022 1:58:30 PM	Audit	Data	GC Scouting Run - Injection	Data File Path: Tower, Front SSL, Front FID - F:\FPD_SC001.D\FPD1A.ch
Part of System Preparation - No limits associated				
April 22, 2022 1:58:50 PM	End	Execution	GC Scouting Run - Injection	Run Count: 1
Tower, Front SSL, Front FID - Part of System Preparation - No limits associated				

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

เอกสารไม่ควบคุม

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User Name: saengathai.tarak		System ID: CN13113001	
Hostname: LAPTOP-CQ28KQ8M		Print Date: April 22, 2022 2:32:18 PM	
CN13113001 Transaction log :			
Time	Transaction State	Activity Performed	Optional Information
April 22, 2022 1:58:53 PM	Start	Execution	Noise and Drift - Front FID -> Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/Hour
April 22, 2022 1:59:46 PM	Audit	Data	Noise and Drift - Front FID -> Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/Hour
April 22, 2022 1:59:51 PM	End	Execution	Noise and Drift - Front FID -> Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/Hour
April 22, 2022 1:59:55 PM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%

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User Name: saengathai.tarak

Hostname: LAPTOP-CQ28KQ8M

System ID: CN13113001

Print Date: April 22, 2022 2:32:18 PM

CN13113001 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\FID_Prot1-008\FID1A.ch
April 22, 2022 2:00:18 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: F:\FID_Prot1-009\FID1A.ch
April 22, 2022 2:00:40 PM	End	Execution	Injection Precision - Injection Tower, Front SSI, Front FID -> GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
April 22, 2022 2:00:45 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSI, Front FID -> Detector FID - L -> 3000000	None
April 22, 2022 2:13:54 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSI, Front FID -> Detector FID - L -> 3000000	Data File Path: F:\FID_SN-012\FID1A.ch
April 22, 2022 2:14:05 PM	End	Execution	Signal to Noise - Injection Tower, Front SSI, Front FID -> Detector FID - L -> 3000000	Run Count: 1
April 22, 2022 2:14:09 PM	End	Qualification	Session	OQ
April 22, 2022 2:14:09 PM	Start	Reporting	Session	None
April 22, 2022 2:31:42 PM	Audit	Reporting	Session	Report Generated: Certificate

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

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Date: April 22, 2022 2:32:15 PM  
System ID: CN13113001

เอกสารไม่ควบคุม

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Agilent CrossLab Start-Up Services  
Agilent 7890 Gas Chromatograph  
Preventive Maintenance Checklist

Agilent 7890 GC Preventive Maintenance Checklist

**Introduction**

**Customer Information**

- Customer's details should be provided to the engineer who is performing the preventive maintenance.
- Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.
- Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.
- Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.

**Important Customer Notes**

- For more information about Agilent's preventive maintenance services, please visit our website at <http://www.agilent.com/preventivemaintenance>.
- The Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.
- Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.
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Revision 2.0, issued September 16, 2021  
Agilent Document Number: 59922-901  
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Agilent CrossLab Start-Up Services  
Agilent 7890 Gas Chromatograph  
Preventive Maintenance Checklist

Agilent 7890 GC Preventive Maintenance Checklist

**Introduction**

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Agilent CrossLab Start-Up Services  
Agilent 7890 Gas Chromatograph  
Preventive Maintenance Checklist

Agilent 7890 GC Preventive Maintenance Checklist

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Agilent CrossLab Start-Up Services  
Agilent 7890 Gas Chromatograph  
Preventive Maintenance Checklist

Agilent 7890 GC Preventive Maintenance Checklist

**Introduction**

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- Agilent's preventive maintenance services are available to the customer who is using the preventive maintenance services.
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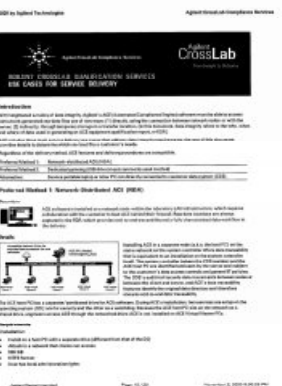
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<b>Report and Delivery Options</b>	
<p>The system-generated report lists only different options and classes for the primary and requested option type. Business option values are not in parentheses in the EOP.</p>	
<p>Other abbreviations:</p> <ul style="list-style-type: none"> <li>Other system and device or carrier</li> <li>Transit mode</li> <li>Transit mode/origin</li> </ul>	
<b>Selected Signature Options</b>	
<p>Basic EOP is required</p> <p>Delivery service is selected in the EOP</p>	

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Agilent Instrument Qualification Services



Agilent CrossLab  
 Your Analytical Solution

# EQUIPMENT QUALIFICATION REPORT (EQR)

Agilent CrossLab Compliance

Qualification Type	QC/MS
System ID	CN12110001
EQR Name	AgilentInstrumentQual
EQR Revision	02.02.01
EQR Publish Date	November 2002
Exp.	April 02, 2003 2:02:48 PM
Report Type	Pass
Eq. Name	United Analytical and Engineering Corporation
Eq. Location	3301 Glenhurst #1 Southshore Road, Bangalore, Maharashtra, Bangalore 110001

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<b>5. 3RD Party Application</b>	
<b>Service Details</b>	
Product	
The vendor install local server and delivery mode for this service.	
Service or Service	000-000000
Service Order No./Request	000-000000
ERP Module	Application/Component
ERP Extension	000-0000
Access Type	Report
Organization Details	
Name	United Insurance and Engineering Company
Address	550/ 25550041 #1 Sukhumvit Road, Bangkok, Phrasangthong Bangkok 10110
Local/Contact Details	
Name	A. Noppradorn Pichaiyaprasit
Job Title	Director
Qualification Location	Insuranceservice.co.th
Customer Details	
Name	Strategic Risk
Job Title	Risk Service Engineer
Date Acquisition Details	
Acquisition Software Name	Chromatation
Acquisition Software Version	C-1111 Version 23
Customer Data System ID/ID	001/000000000000

Date: _____ Revision: 01		April 01, 2002 (Initial Rev) 010101 (001)
Page 2 - 103		
<b>8.88710: Agilent Technologies</b>		<b>Agilent/Agilent Computers Service</b>
<b>8.88710-2</b>		
Manufacturer	Agilent Technologies	
Model	7890	
Type	FID+	
Model#	849691A	
Control Type	Electronic Pressure Control (EPC)	
LIN/MSD	None	
Detector Size	1/4" height	
Flow Effect System	FID/MSD	

[illegible]

E 101-15: Agile Toolchain		Agile@Work: An Organizational Framework
<b>Instrument Details</b>		
Program		
One instrument assesses the software system configuration.		
Keywords		
System		
Software ID		CM-10-0007
Manufacturer		Agile Toolchain
Media		Web
File Size (KB)		Minimal Data
Test/Measurement Case Type		Minimal Data Other Case Mapping
Project Configuration		
Agile Toolchain		Agile Toolchain
Web		Web
Developer		Web
API/Interface/API		Web
Project Configuration		Agile Toolchain
Agile Toolchain		Agile Toolchain
Web		Web
Developer		Web
API/Interface/API		Web
Sample 1		
Manufacturer		Agile Toolchain
Type		Agile Toolchain
Media		Web
File Size (KB)		Minimal Data
Test/Measurement Case Type		Minimal Data Other Case Mapping
Project Configuration		Agile Toolchain
Agile Toolchain		Agile Toolchain
Web		Web
Developer		Web
API/Interface/API		Web
Project Configuration		Agile Toolchain
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API/Interface/API		Web
Project Configuration		Agile Toolchain
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API/Interface/API		Web
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Project Configuration		Agile Toolchain
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API/Interface/API		Web
Project Configuration		Agile Toolchain
Agile Toolchain		Agile Toolchain
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Developer		Web
API/Interface/API		Web
Project Configuration		Agile Toolchain
Agile Toolchain		Agile Toolchain
Web		Web
Developer		Web
API/Interface/API		Web
Project Configuration		Agile Toolchain
Agile Toolchain		Agile Toolchain
Web		Web
Developer		Web
API/Interface/API		Web
Project Configuration		Agile Toolchain
Agile Toolchain		

P-8000-Agilent Technologies		Agilent Openstack Compliance Scan	
Inventory ID	Agilent Technologies		
Type	Tag		
Name	7890		
Model Number	1201-001-000		
Serial Number	000-000-000		
Production Location	AL 30 30		
Old Name	Not available		
Inventory ID	Agilent Technologies		
Name	7890		
Model Number	1201-001-000		
Serial Number	000-000-000		
Production Location	AL 30 30		
Open Type	Standard		
Inventory ID	Agilent Technologies		
Name	7890		
Type	Tag		
Location	AL 30 30		
Serial No.	Not available		
Current Type	Standard Production Location (P70)		
Location	Not available		
Inventory ID	Agilent Technologies		
Name	7890		
Type	Tag		
Location	AL 30 30		
Serial No.	Not available		

[illegible]

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<b>Protocol Details</b>					
<b>Prepared</b> Elizabeth Allen for comparison of test and write used in this report. For complete test results, see original test change sheets, with to the Angkor® Address document.					
Test Method		Test			
<hr/>					
MC-101.01	Session Flow Summary				
MC-101.02	GC User Participation Analysis				
MC-101.03	MC User Participation Analysis				
GC-101.01	GC Scoring Process				
MC-101.01	Angkor Process				
GC-101.02	Web/Phone Scoring				
GC-101.03	Web/Phone/Phone				
GC-101.04	Phone and Web				
GC-101.05	Angkor Interface				
GC-101.06	Session Overview and Basic Scoring with Examples				

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v1.0.0   by Light Technology			Advanced Analytics Dashboard v2.0					
<h2>Detector Flow Accuracy</h2>								
<b>Purpose</b> This tool is used to determine if measuring flow rates with a calibrated flow meter and comparing them to theoretical values and other sensor data within the IoT ecosystem.								
<b>Configuration Details</b>								
Name	Flow		Unit	m³/s				
Subject	Flow Type	Unit	30.0 mL/min					
<b>Measurements and Results</b>								
Step	Flow	Unit						
10.0	30.0	mL/min						
Measured	Flow	Unit	30.0	mL/min				
Agreed Percentage	40	10.0	% agreed	1	100%			
NOTE: A comparison of subject to 10 individuals, which are not listed.								
Report Status	Flow							
Subject	Flow Type	Unit	30.0 mL/min					
<b>Measurements and Results</b>								
Step	Flow	Unit						
10.0	30.0	mL/min						
Measured	Flow	Unit	30.0	mL/min				
Agreed Percentage	40	10.0	% agreed	1	100%			
NOTE: A comparison of subject to 10 individuals, which are not listed.								
Report Status	Flow							

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## เอกสารไม่ควบคุม

## เอกสารไม่ควบคุม

[illegible]

**GC Oven Temperature Stability**

Purpose: This test uses a calibrated digital thermometer to determine the stability of the oven temperature. Stability is expressed as the ratio between the largest and smallest measured temperatures.

Comparative Data:

Name	Model
Temperature	100.0 °C
Time	2.0 hr

Results:

Measurements	Time	Temperature	Stability
1. 10.00	100.0 °C	High	100.0 °C
2. 15.00	100.0 °C	High	100.0 °C
3. 20.00	100.0 °C	Low	100.0 °C
4. 25.00	100.0 °C	High	100.0 °C
5. 30.00	100.0 °C	High	100.0 °C
6. 35.00	100.0 °C	High	100.0 °C

Stability Ratio: 1.00

GC Oven Temperature Stability Test Results

Plot:

GC Oven Temperature Stability Test Results

Plot:

GC Oven Temperature Stability Test Results

Plot:

GC Oven Temperature Stability Test Results

Plot:

GC Oven Temperature Stability Test Results

Plot:

GC Oven Temperature Stability Test Results

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GC Oven Temperature Stability Test Results

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GC Oven Temperature Stability Test Results

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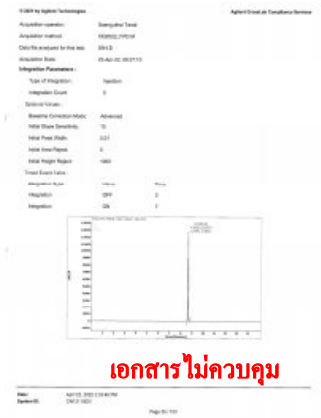
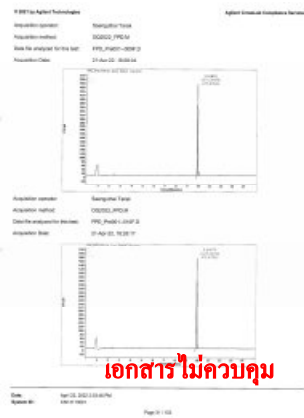
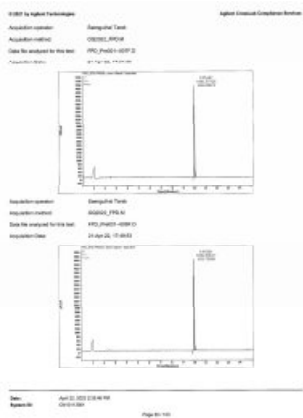
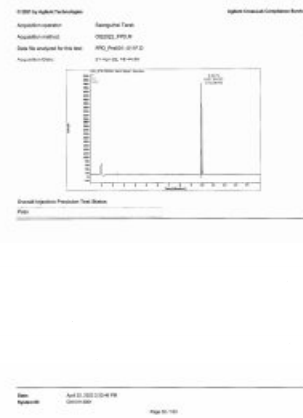
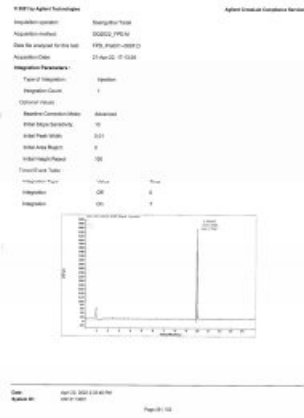
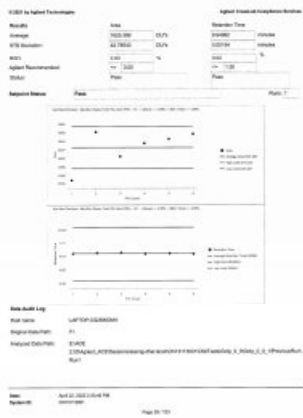
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B0017: Higher Tonnages		Higher Production/Production Rate	
Activity/Event (Control)	Stomping/Stamp		
Execution method	EXPLOSION, FIRE		
Execution standard for this task	EN 12021-2		
Execution Date	21-Apr-2018		
<b>Integration Parameters:</b>			
Type of Integration	Integration		
Integration (Type)	1		
Control Values			
Baseline Configuration (Value)	Actual/Std		
ENR Risk Category	10		
Initial Phase (Value)	0.0.0		
ENR Area (Value)	0		
Initial Configuration	100		
<b>Integration Type:</b>			
Integration Type	Integration		
Integration	EXP		
Integration	Std		

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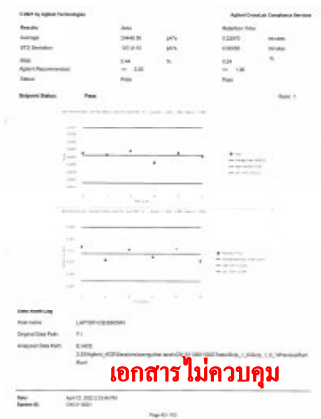
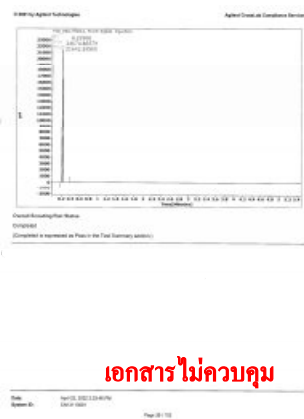
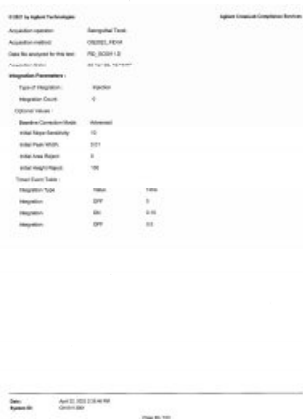
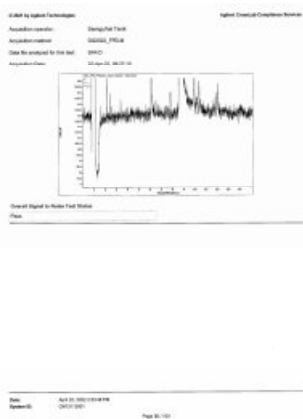
## เอกสารไม่ควบคุม

## เอกสารไม่ควบคุม



## เอกสารไม่ควบคุม

## เอกสารไม่ควบคุม



## เอกสารไม่ควบคุม

## เอกสารไม่ควบคุม



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**Bivariate Normal Dataset**

Convergence speed  
 Acquisition method  
 Data file analyzed by this tool  
 Acquisition date

**Bivariate Uniform Dataset**

Convergence speed  
 Acquisition method  
 Data file analyzed by this tool  
 Acquisition date

[illegible]

2023 Topological Technologies

Application tested: **Geographic Test**

Acquisition method: **ORFED/PCIM**

Data file name/path: **PCIM\_2023\_07\_27.D**

Acquisition Method: **ORFED/PCIM**

Integration Parameters:

Type of Integration:	Integration
Integration Event:	0
Calibration value:	0
Baseline Correction Method:	Advanced
Initial Scan Sensitivity:	12
Acquisition Mode:	SAI
Initial Data Report:	0
Acquisition Report:	100

Method used: **Topological**

Integration Type:	PCIM	ORFED
Integration:	EPF	0
Integration:	SAI	5-10
Integration:	SAI	12

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## Declaration of Change Control

The document under change control. Recommendations to be included and published on each document. Added to the master documents limited to create control. Documents include published items and served to assign an employee role. The significant performance exceeding in the document. Also only in the future performance in evaluation in a year or less than the employee. Against the change increases the management of change (change management) and in good (2018/2019) instead the initiative process. This change in the strategic or strategic business or software need for early approval. A change management system provides a means for managing the degree of complexity required according to the nature of the project needs. An outline of the change must be thoroughly recorded and documented. Together with details of completed tasks and its results. Note: Performance change management is the customer's responsibility.

Doc#

Reg#0001

April 01, 2020 09:45 AM

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Doc#

Reg#0001

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Version: 1.0

Document Name: Customer Training Certificate and Qualification

1. Introduction

## Certificate of Completion

Student Name: Mr. John Doe

Date of Course: 15th Dec 2023

Completion Date: 15th Dec 2023

Certificate Expires: 15th Dec 2025

**2. Course Description and Objectives**

This course is designed to provide participants with a comprehensive understanding of the fundamentals of Artificial Intelligence (AI) and its applications in various industries. The course covers the following topics:

- Introduction to AI and Machine Learning
- Data Preprocessing and Feature Engineering
- Supervised Learning: Linear Regression, Logistic Regression, Decision Trees, Random Forests
- Unsupervised Learning: K-Means Clustering, Hierarchical Clustering, Principal Component Analysis (PCA)
- Deep Learning: Neural Networks, Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN)
- AI Ethics and Responsible AI

By the end of the course, participants will be able to:

- Understand the basic concepts of AI and Machine Learning.
- Preprocess and engineer features from raw data.
- Build and evaluate supervised learning models.
- Build and evaluate unsupervised learning models.
- Build and evaluate deep learning models.
- Understand the ethical implications of AI and responsible AI practices.

3. Conclusion

We are pleased to announce that you have successfully completed this course. Your certificate of completion is valid for 24 months from the date of issuance. We encourage you to continue your learning and exploration in the field of AI and Machine Learning.

4. Contact Information

For more information or to request a copy of this certificate, please contact us at [support@infinite-tech.com](mailto:support@infinite-tech.com).

5. Terms and Conditions

This certificate is issued by Infinite Technologies and is valid only for the purpose stated above. It is not a guarantee of any specific outcome or result. The certificate is issued on the condition that the holder agrees to use it for personal or professional purposes only and not for any other purpose.

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 Network      Highest Network Completion: Network

Document Name:      Client's training certificate and qualifications

---

**Client Information**

**Certificate of Completion**

Student Name:      Shawanda King-Tyler

Start Date:      ACED 300 & 304 & Operations CM-CU Performance Update

Completion Date:      October 16, 2007

Completion Location:      Lawrenceville, Georgia

**Attestation**

**I, the undersigned, being duly qualified by law, do hereby certify that the above-named student has successfully completed the course of instruction and has been awarded the certificate of completion.**

**Signature of Instructor:** \_\_\_\_\_  
**Name:** \_\_\_\_\_  
**Title:** \_\_\_\_\_

**Date:** \_\_\_\_\_  
**Signature:** \_\_\_\_\_  
**Name:** \_\_\_\_\_  
**Title:** \_\_\_\_\_

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**Examination Number:**

**Exercises of Statistics I**

**Subject Coordinator:** Catarina Pereira

**1. Data**

The following is a dataset (after being treated) obtained by the Service support and the marketing department of a bank in order to study the bank's credit portfolio. The variable *x* is measured in percentages of credit in relation to the bank's activity in a particular time and *y* is measured in thousands of Euros (€ 1000) at the time in the 2014-2015 academic year. The data are presented in Table 1. The size of the dataset is the activity of the company in the 2014-2015 year.

**2. Scatter plot**

Construct a scatter plot, a point plot and identify any statistical feature, indicate and interpret the relationship and correlation between the two variables: *x* and *y*.

**3. Regression**

Construct the linear regression model and calculate the coefficient of determination,  $R^2$ .

**4. Hypothesis testing**

Test the null hypothesis  $H_0: \mu \leq 10$  against the alternative hypothesis  $H_1: \mu > 10$  at a significance level of 5%.

**5. Confidence interval**

Construct a 95% confidence interval for the population mean  $\mu$ .

**6. ANOVA**

Test the null hypothesis  $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$  against the alternative hypothesis  $H_1: \mu_i \neq \mu_j$  for some  $i, j$  at a significance level of 5%.

**7. Regression**

Construct the linear regression model and calculate the coefficient of determination,  $R^2$ .

**8. Hypothesis testing**

Test the null hypothesis  $H_0: \mu \leq 10$  against the alternative hypothesis  $H_1: \mu > 10$  at a significance level of 5%.




**9. Confidence interval**

Construct a 95% confidence interval for the population mean  $\mu$ .

**10. ANOVA**

Test the null hypothesis  $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$  against the alternative hypothesis  $H_1: \mu_i \neq \mu_j$  for some  $i, j$  at a significance level of 5%.

Document Name: Certificate of Calibration Date Periodicity

## Certificate of Calibration

AUTHORIZED TO ACCREDITED BY CALIBRATION PERFORMANCE  
 Date of Issue: 21-Nov-05  
 Validity to: Indefinite

**Cal. No. PEY2-2104087701**  
 Page 1 of 1

**Identification Numbers**

Revision: 001 Drawing: 001 Revision Date: 05	Material Certificate: 001 Material Certificate: 001 Date of Material Certificate: 05 Date of Material Certificate: 05
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**NO. 1**

MEASUREMENT		UNCERTAINTY (1ST ORDER)		MEASUREMENT UNCERTAINTY	
MEASUREMENT	UNIT	MEASUREMENT	UNIT	MEASUREMENT	UNIT
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2.0	mm	0.001	mm	0.001	mm
3.0	mm	0.001	mm	0.001	mm
4.0	mm	0.001	mm	0.001	mm
5.0	mm	0.001	mm	0.001	mm
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Agilent Laboratories Compliance Services

Document Number: Certificate of Calibration Record

Agilent 1100A  
a. 10. 10.1

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Date: April 22, 2022 13:49:56  
Signature: 1001010022

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2021 to Higher Technologies

Agilent Instrument-Integration Resources

Enclosed Name:      Contribution of Calibration Thermometers



**เอกสารไม่ควบคุม**

Date:      Signature:     

Agilent 8871      8871-01      8871-01      8871-01

Page 1 of 1

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Document Number: Certificate of Compliance  
 Issued To: Agilent Technologies  
 Issued On: April 22, 2010 11:44 AM  
 Issued By: JRM

Page 17 of 182

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Customer Name: \_\_\_\_\_
Continuation of Calibration Temperature Profile

**CERTIFICATE OF CALIBRATION**

**No. : CEN00747**  
**Date of Issue: 10<sup>th</sup> Aug. 2017**

**Type & Grade of the Instrument:** **Temp. & Humidity Controller**  
**Model No. & Identification Number:** **Temp. & Humidity Controller**

**Tag No.:** **2247**  
**Identification Mark:** **Temp. & Humidity Controller**

**Remarks:** **As per calibration certificate no. 2247, the measured temperature of the instrument on 10<sup>th</sup> Aug. 2017 was found to be within the tolerance limits as per ISO 9001:2015.**

Point (Dry Bulb)	Set Point	Measured	Uncertainty
1	20.0	20.0	±0.05
2	25.0	25.0	±0.05
3	30.0	30.0	±0.05
4	35.0	35.0	±0.05
5	40.0	40.0	±0.05

Point (Wet Bulb)	Set Point	Measured	Uncertainty
1	20.0	20.0	±0.05
2	25.0	25.0	±0.05
3	30.0	30.0	±0.05
4	35.0	35.0	±0.05
5	40.0	40.0	±0.05

**Calibration Certificate No.:** **2247** **Calibration Date:** **10<sup>th</sup> Aug. 2017**

**Signature of the Calibration Engineer:** \_\_\_\_\_ **Signature of the Customer:** \_\_\_\_\_

**Remarks:** **As per calibration certificate no. 2247, the measured temperature of the instrument on 10<sup>th</sup> Aug. 2017 was found to be within the tolerance limits as per ISO 9001:2015.**

**Signature of the Calibration Engineer:** \_\_\_\_\_ **Signature of the Customer:** \_\_\_\_\_

**Date:** \_\_\_\_\_ **Page No.:** 1/1

**CERTIFICATE OF ANALYSIS**

**Product Name:** Certificate of Calibration Temperature Probe

**Lot Number:** 123456789

**Date of Manufacture:** 12/15/2023

**Expiry Date:** 12/15/2025

**Manufacturer:** ABC Calibration Services Inc.

**Model:** CP-1000

**Serial Number:** SN-987654321

**Calibration Method:** NIST Traceable Thermometer Comparison

**Measurement Range:** -50°C to 150°C

**Accuracy:** ±0.1°C

**Resolution:** 0.01°C

**Uncertainty:** ±0.05°C

**Test Results:**

Temperature (°C)	Measured Value (°C)	Error (°C)
-50	-50.02	-0.02
-25	-25.01	-0.01
0	0.00	0.00
25	25.01	+0.01
50	50.02	+0.02
75	75.01	+0.01
100	100.00	0.00
125	125.01	+0.01
150	150.02	+0.02

**Signature:** [Signature]

**Name:** John Doe

**Title:** Quality Control Manager

**Company:** ABC Calibration Services Inc.

**Contact Information:** Phone: (555) 123-4567 | Email: info@abc-cal.com

**Page 1 of 1**

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## เอกสารไม่ควบคุม

## 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: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university> to learn about training options, which include online, classroom and on-site 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>

## 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.

## System Information

- ☑ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument system name and ID	GC 8870
Instrument system site and location	UAE
List system component product numbers	List the serial numbers of each component
1. G3542A	1. CN1925A066
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.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

## 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/Splitless 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.

## 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 syringe 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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เอกสารไม่ควบคุม

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 model where used	Quantity consumed
PP Inlet PM kit	5188-6498	8890 GC	—
Split vent trap PM kit, single cartridge (for MMI, PTV & V)	5188-6495	8890 GC	—
MMI Cleaning Kit	G3510-60820	8890 GC	—
PTV Septumless Head Rebuild Kit	5182-4747	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: 6005340258 Date service completed: 13 Jun 2021  
Agilent signature: Adinok E. Customer signature: \_\_\_\_\_  
Total number of pages in this document: 7



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Do not include this section/page in the published, customer-facing PDF version.

This page is only relevant for Agilent source documents for document control purposes and is NOT intended for customer viewing. Refer to the SPIIFPM checklist Authoring Guide for more information.

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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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
- ☒ ☐ ☐ ☐ ☐ Yes selected means that the task was done or the part was required.
- ☐ ☒ ☐ ☐ ☐ No selected means that the task was not done or the part was required.
- ☐ ☐ ☒ ☐ ☐ Means that this task is recommended to be done at 6-month intervals.
- ☐ ☐ ☐ ☒ ☐ 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.
- ☐ ☐ ☐ ☐ ☒ As needed means that the task was done or the part was used as needed. Could be two type 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 preventative 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. G7072B	1. US1009M037
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"/>	Abrasive paper, 30 µm	1601-5896
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Alumina powder	263796201
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, clean (package of 15)	85091-60051
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, cleaning (package of 300)	9319-4828
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cotton swabs (package of 100)	5030-5400
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, large	8650-0036
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, small	8650-0019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Grease, Apizcon L, high vacuum	6040-0289

#### Common MS Filters and Seals – 5973/5975/5977/7000/7010/7200/7250 Series

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Helium gas filter – if required	RM5H-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter – if required	RM5N-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" Hg, Hydrogen – if required	RM5HY-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Carrier Gas Kit for 7880 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 SS/MS Filter – if required	CP17973
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chemical Ionization Gas Purifier (CI systems) – if required	5190-0071
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Foreline Pump Oil, Inland 45	5040-0034

#### MS Maintenance Supplies for 5973/5975/5977

Yes/No	Interim/Major/As needed	Description	Part number
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Diffusion pump fluid (Diffusion Pump Models)	6045-0889 Dry 2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ODP-3 Tip Seal Replacement Kit (ODP-3 Dry Pump Models)	67077-42918
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS42 Oil Mist Eliminator 3/40 & 3/8	5P03796954
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Exhaust oil mist trap (Honeywell) Edwards/Pfeiffer	51999-00306

#### 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	RM5N-2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oil Mist Filter RV5	06609-00143

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MS Maintenance Supplies for 7200/7250

Yes/No	Interim/Major/As needed	Supplies	Part number
<input type="checkbox"/>	<input type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input type="checkbox"/>	<input type="checkbox"/>	RIS Probe Maintenance Kit (7200 Series only)	G7095-60170
<input type="checkbox"/>	<input type="checkbox"/>	DS202 Oil Mist Eliminator	SR83709816
<input type="checkbox"/>	<input type="checkbox"/>	IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Pump Models)	XSR15-67003
<input type="checkbox"/>	<input type="checkbox"/>	Filter element, for SH-110/SH-112/IDP-15 exhaust silencer	REFL31/REFLTER1
<input type="checkbox"/>	<input type="checkbox"/>	OS 3/8 MAD, PLUG AND GASKET	SR83701824

MS Maintenance Supplies for JetClean

Yes/No	Interim/Major/As needed	Supplies	Part number
<input type="checkbox"/>	<input type="checkbox"/>	Big Universal Trap, 1/8in Hpts, 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 5973/5975/5977/7000/7010/7200/7250

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	EI High Temperature Filaments	G7005-60061 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	MS-EI Filaments	G7002-60061
<input type="checkbox"/>	<input type="checkbox"/>	LE-EI Filaments	G3840-60021
<input type="checkbox"/>	<input type="checkbox"/>	CI High Temperature Filament – all MSDs	G7005-60072
<input type="checkbox"/>	<input type="checkbox"/>	PFTBA, GCMS Tuning Standard, calibrant	35071-00571
<input type="checkbox"/>	<input type="checkbox"/>	PFOTD calibrant, 1 ml	35060-60118
<input type="checkbox"/>	<input type="checkbox"/>	PFET, IRM calibrant for GC QTOF 0.5 ml	3190-6531

MS Maintenance Supplies for 5973/5975/5977

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal (tip and spring combo)	G1999-60412
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal (tip only)	G3870-20542
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal spring (spring only)	G1999-20023
<input type="checkbox"/>	<input type="checkbox"/>	Repeller insulator	G1999-20133 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043
<input type="checkbox"/>	<input type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548

MS Maintenance Supplies for 7000/7010

Yes/No	Interim/Major/As needed	Description	Part number
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal - 7000	G1999-60412
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal - 7010	G7002-60412
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal (tip only)	G3870-20542
<input type="checkbox"/>	<input type="checkbox"/>	CI Interface tip seal spring (spring only)	G1999-20023
<input type="checkbox"/>	<input type="checkbox"/>	Repeller insulator - 7000	G1999-20133 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043
<input type="checkbox"/>	<input type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548

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MS Maintenance Supplies for 7200

Yes/No	Interim/Major/As needed	Supplies	Part number
<input type="checkbox"/>	<input type="checkbox"/>	Extractor Lens Insulator	G7005-20135
<input type="checkbox"/>	<input type="checkbox"/>	Ion Focus Insulator	G7005-20442
<input type="checkbox"/>	<input type="checkbox"/>	Ring Heater/Sensor Assembly	G7005-60110
<input type="checkbox"/>	<input type="checkbox"/>	RIS Xfer Tip	G7005-20547
<input type="checkbox"/>	<input type="checkbox"/>	RIS Xfer Tip Spring	G7005-20024

MS Maintenance Supplies for 7250

Yes/No	Interim/Major/As needed	Supplies	Part number
<input type="checkbox"/>	<input type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043
<input type="checkbox"/>	<input type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547
<input type="checkbox"/>	<input type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548
<input type="checkbox"/>	<input type="checkbox"/>	EI Extractor Transfer Tip	G3870-20542
<input type="checkbox"/>	<input type="checkbox"/>	CI Tip Compression Spring	G1999-20023

MS Maintenance Supplies for Intuvo 9000 MS Systems

Yes/No	Interim/Major/As needed	Systems	Part number
<input type="checkbox"/>	<input type="checkbox"/>	Swaged MS Tail - Packaged	G4516-60080
<input type="checkbox"/>	<input type="checkbox"/>	Swaged MS Tail (HES) - Packaged	G4516-60155

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Preventive Maintenance Checklist:

Yes/No	Interim/Major	Description
<input type="checkbox"/>	<input type="checkbox"/>	Perform general inspection of system for cleanliness.
<input type="checkbox"/>	<input type="checkbox"/>	Discuss any problems the customer is having with the instrument.
<input type="checkbox"/>	<input type="checkbox"/>	Review customer maintenance records and exclude maintenance on recently serviced items.
<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	GCMS
<input type="checkbox"/>	<input type="checkbox"/>	Record instrument model no.
<input type="checkbox"/>	<input type="checkbox"/>	Record instrument serial no.
<input type="checkbox"/>	<input type="checkbox"/>	Record Rough Vacuum.
<input type="checkbox"/>	<input type="checkbox"/>	Record Manifold Vacuum.
<input type="checkbox"/>	<input type="checkbox"/>	Type of Column installed.

Yes/No	Interim/Major	System Checks
<input type="checkbox"/>	<input type="checkbox"/>	Check manually that you have calibration peaks.
<input type="checkbox"/>	<input type="checkbox"/>	Vent the instrument.
<input type="checkbox"/>	<input type="checkbox"/>	Inspect vacuum hoses, pump exhaust tubing and power cords for excessive wear.
<input type="checkbox"/>	<input type="checkbox"/>	Visually inspect the calibrant levels – PFTBA, PFOTD (if appl), IRM (if appl). Refill if necessary.
<input type="checkbox"/>	<input type="checkbox"/>	Look for any obvious external damage or problems.
<input type="checkbox"/>	<input type="checkbox"/>	Clean air intake(s). Cosmetic cover(s) may need to be removed.
<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
<input type="checkbox"/>	<input type="checkbox"/>	Check for evidence of oil leakage. Check pump gasket for leakage.
<input type="checkbox"/>	<input type="checkbox"/>	Drain and replace mechanical pump oil.
<input type="checkbox"/>	<input type="checkbox"/>	Replace Oil Mist Filter if applicable.
<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"/>	Demonstrate ballast, if requested.
<input type="checkbox"/>	<input type="checkbox"/>	Anti-suckback test.

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Diaphragm
<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"/>	If vacuum is poor, then replace the diaphragm pump.
<input type="checkbox"/>	<input type="checkbox"/>	Anti-suckback test.

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Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Dry Mechanical vacuum pumps - Scroll</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the tip seal on the IDP pump.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum - Turbo Power Demand, poor manifold vacuum.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the Exhaust Filter if required.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent changes if needed.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Inform customer that pump gas ballast should be installed all the time.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Anti-suckback test.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Cleaning System and Filters</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Fans</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fans are functional, area is cleared around fans.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Source Cleaning</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Disassemble, Clean, Re-assemble source.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Re-install source and close analyzer.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Filters</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSH-2 Helium gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSH-2 Nitrogen gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSHY-2 Hydrogen gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17988 - Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount, and Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17974 - Gas Clean Filter Kit GC/MS 1/8 in. Mount and Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17973 - Gas Clean Filter: Replacement Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	S190-9071 - Methane Gas Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>System post-check</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Leak Check</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s).
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change In Tune and verify that all temperatures, pressures, and gas flows reach method set points.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<b>EI Autotune Performed</b>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Rough Vacuum
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vacuum Manifold
<input checked="" type="checkbox"/>	<input checked="" 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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**Agilent GC/MS Preventive Maintenance Checklist**

**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 IG records.

**Agilent Test Results Table:**

Test Description	Expected Test Result	Actual Test Result
Auto Tune	Pass	Pass

**Agilent Parts List Table:**

☐ Section NOT Applicable

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/technical](http://www.agilent.com/chem/technical)  
[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**

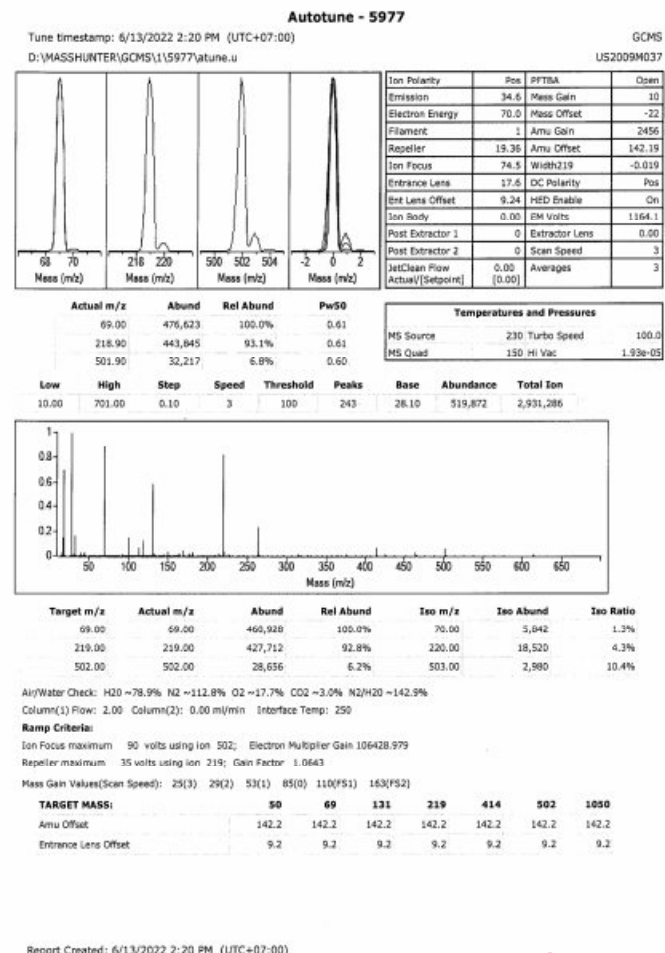
Service request number: 6025302253      Date service completed: 13 Jun 2018

Agilent signature: Agilent      Customer signature: \_\_\_\_\_

Number of pages: 18

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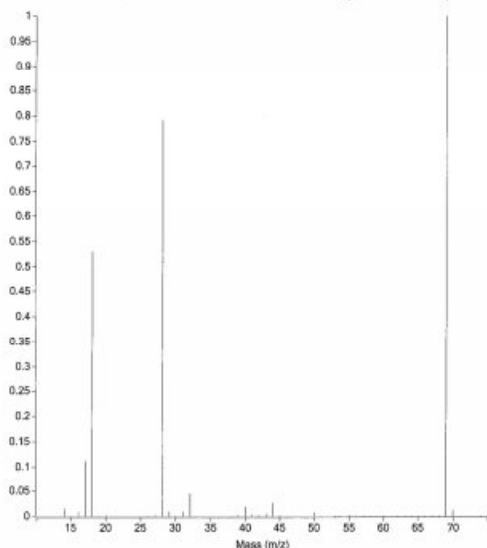


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Instrument: GCMS  
Mon Jun 13 14:38:41 2022

D:\MASSHUNTER\GCMS\1\5977\



Current Params used: atune.u

Relative abundances:

18/69 = 53.00  
28/69 = 79.22  
32/69 = 4.56  
44/69 = 2.67  
28/18 = 149.48

Water%  
Nitrogen%  
Oxygen%  
Carbon Dioxide%  
Nitrogen/Water%

(counts=254656)  
(counts=380672)  
(counts=21888)  
(counts=12840)

Instrument Name : GCMS  
DC Polarity : Positive  
Filament : 1  
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 220 : 220.00 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

597x Air and Water Check  
Mon Jun 13 14:26:14 2022  
D:\MASSHUNTER\GCMS\1\5977\atune.u  
Instrument: GCMS  
US2009M037

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 : 1164 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.

เอกสารไม่ควบคุม

System Verification for GCMS

Mon Jun 13 14:26:30 2022

เอกสารไม่ควบคุม



# TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN) CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 BATTANAKARN ROAD SOI 12, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2713-3000-24 FAX: 0-2710-9484

## Certificate of Calibration

Cert.No.: 22CH1184  
Page.: 1 of 2

Equipment : Turbidity Meter  
Manufacturer : Oakton  
Model : T100IR  
Serial No. : 1120501017  
ID. No. : UAE.WAT.056/2563  
Condition As-Received: Used Item  
Received Date : 31 August 2022  
Calibration Date : 05 September 2022  
Reference : 2206-1106WSC-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 ± 20) %  
Calibration Procedure : In - house method : CP-CH11  
based on direct measurement by  
using Formazin standard solution  
Calibrated by : Walsalak Sirithean  
Approved by :   
( ) Malee Butkrues  
( ) Sathip Meangmai  
( ) Warakorn Lemgagtrakul  
Issue Date : 6 September 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 Calibration and Testing Equipment Services.

เอกสารไม่ควบคุม

A 0009588



Cert.No.: 22CH1184  
Page.: 2 of 2

### Condition of this calibration result

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

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	1103328	130EC010	22H1313	12 June 2023
2) Electronic Balance	N03679	140RC001	21MM429	21 Sep 2022

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

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

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

### Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU  
Turbidity Meter Serial Number : 1120501017

Standard Formazine suspension ( NTU )	UUC* Reading ( NTU )	Uncertainty of Measurement ( ± NTU )	Coverage Factor k
0	0.00	0.0062	2.00
20	20.1	0.39	2.00
100	102	0.74	2.00
400	403	1.5	2.13
800	804	2.1	2.20

Remark : - UUC\* = Unit Under Calibration  
- NTU = Nephelometric Turbidity Units

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

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