

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



ภาคผนวก ง-1

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

CERTIFICATE OF CALIBRATION

Certificate No. : COF-024-68

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER : Top Load Office
MODEL/TYPE : Andersen Instruments
SERIAL NUMBER : 625A
ID NUMBER : 1270
CONDITION AS-RECEIVED : UAE ANV.009/2542
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 18 Jun 2025
MEASUREMENT DATE : 26 Jun 2025
ISSUE DATE : 26 Jun 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 22.9 °C and 53.4 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values:

Calibration procedure:
The Office gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model 665/MC/W250. The W-CL-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standard by way of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MIP0016-25.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	Δp_{Office} inH ₂ O	F	Standard Flow [Q_s] m^3/min
1	0.703	754.416	23.21	23.61	47.031	1.691	1.295	0.660
2	1.002	754.401	23.74	23.07	52.009	3.402	1.841	0.932
3	1.118	754.433	23.82	23.28	35.470	4.453	2.107	1.064
4	1.169	754.534	23.79	23.25	26.488	4.951	2.230	1.126
5	1.411	754.354	23.68	23.02	26.272	7.325	2.702	1.360

Slope (a): 2.00231
Intercept (b): -0.02296
Correlation coefficient (r): 0.99986
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	Δp_{Office} inH ₂ O	F	Standard Flow [Q_s] m^3/min
1	0.703	754.416	23.21	23.61	47.031	1.691	0.815	0.664
2	1.002	754.401	23.74	23.07	52.009	3.402	1.157	0.935
3	1.118	754.433	23.82	23.28	35.470	4.453	1.324	1.067
4	1.169	754.534	23.79	23.25	26.488	4.951	1.401	1.130
5	1.411	754.354	23.68	23.02	26.272	7.325	1.696	1.364

Slope (a): 1.25409
Intercept (b): -0.04439
Correlation coefficient (r): 0.99986
Uncertainty (k=2): 0.015 m^3/min



Calibrated by:
☐ Mr. Sornwit Thachulad
☒ Mr. Jiraporn Lertsomphol



Approved signatory: Mr. Pinyin Booncharoen
Calibration Department Manager

เอกสารไม่ควบคุม

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLUANG, BUNLUANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484

Certificate of Calibration

Certificate No.: 25P3505

Page: 1 of 2

Equipment : U-Tube Manometer

Manufacturer : Dwyer

Model : 1221-36-WM

Serial No.: -

ID No.: UAE.EFM.020/2560

Condition As-Received: Used Item

Received Date: 03 September 2025

Calibration Date: 09 September 2025

Reference: 2508-0144WSC

Ambient Temperature: (29 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1010 mbar

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

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

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

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0216-24	24 Sep 2025

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8. This measurement result is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Sukaen Khankaew
Issue Date: 10 September 2025

Approved Signatory: *Attaporn P.*

[] Phallinee Prapaisa

[] Sura Suwinnest

[x] Attaporn Panuon

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Cert.No.: 25P3505

Page: 2 of 2

Result of calibration: Without adjustment

Function: Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	Low-port side	Δp	Error
0.00	0.00	0.00	0.00	0.00
2.00	0.95	-1.05	2.00	0.00
4.00	1.95	-2.05	4.00	0.00
6.00	2.95	-3.05	6.00	0.00
8.00	3.95	-4.05	8.00	0.00
10.00	4.95	-5.05	10.00	0.00
12.00	5.95	-6.05	12.00	0.00
14.00	7.00	-7.05	14.00	0.05
16.00	8.00	-8.05	16.00	0.05
18.00	9.00	-9.10	18.00	0.10
20.00	10.00	-10.10	20.00	0.10
22.00	11.05	-11.10	22.00	0.15
24.00	12.05	-12.10	24.00	0.15
26.00	13.05	-13.10	26.00	0.15
28.00	14.05	-14.10	28.00	0.15
30.00	15.05	-15.10	30.00	0.10
32.00	16.10	-16.05	32.00	0.15
34.00	17.10	-17.05	34.00	0.15
36.00	18.00	-17.90	35.90	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* Δp = High-port side - Low-port side

* 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-5006-24 FAX. 0-2717-9484

Certificate of Calibration

Certificate No.: 25P3505
Page: 1 of 2

Equipment : U-Tube Manometer
Manufacturer : Dwyer
Model : 1221-59-W/M
Serial No.: -
ID No.: UAE.EFM.0202560

Condition As-Received: Used Item
Received Date: 03 September 2025
Calibration Date: 09 September 2025

Reference: 2509-0144/WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1010 mbar

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

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0218-24	24 Sep 2025

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8. This measurement result is traceable to the International System of Unit maintained through:-

- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 10 September 2025

Approved Signatory :

Atapol P.

[] Phalinee Prabpaijal

[] Sura Suwanneasi

[✓] Atapol Panuratt

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Cert.No.: 25P3505
Page: 2 of 2

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

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

Applied Pressure	UUC Indication		ΔP	Error
	High-port side	Low-port side		
0.00	0.00	0.00	0.00	0.00
2.00	0.95	-1.05	2.00	0.00
4.00	1.95	-2.05	4.00	0.00
6.00	2.95	-3.05	6.00	0.00
8.00	3.95	-4.05	8.00	0.00
10.00	4.95	-5.05	10.00	0.00
12.00	5.95	-6.05	12.00	0.00
14.00	6.95	-7.05	14.00	0.05
16.00	7.95	-8.05	16.00	0.05
18.00	8.95	-9.05	18.00	0.10
20.00	9.95	-10.05	20.00	0.10
22.00	10.95	-11.05	22.00	0.15
24.00	11.95	-12.05	24.00	0.15
26.00	12.95	-13.05	26.00	0.15
28.00	13.95	-14.05	28.00	0.15
30.00	14.95	-15.05	30.00	0.10
32.00	15.95	-16.05	32.00	0.15
34.00	16.95	-17.05	34.00	0.15
36.00	17.95	-18.05	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* 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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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 : 25 March, 2026

Certification No. 198/26

Page : 1 of 2

Object : Weather Station

Manufacturer : Met One Instruments

Type : Data Logger 580 Wind Sensor 034B

Serial No. : Data Logger X20002 Wind Sensor Y11374

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 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: 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 0 - 20 m/sec

Calibrated by : *Watchapol*

Signed : *Pisod*

Mr. Watchapol Subwat

Mr. Pisod Promsut

Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 198/26

25 March, 2026

Page : 2 of 2

Standard	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Correction
Ultrasonic Anemometer				
m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec
1.00	-	-	0.9	0.0
3.02	-	-	3.0	0.02
5.00	-	-	5.0	0.0
7.00	-	-	7.0	0.0
9.02	-	-	9.0	0.02
11.01	-	-	11.0	0.01
13.01	-	-	12.9	0.11
15.01	-	-	15.0	0.01
17.02	-	-	17.0	0.02
20.02	-	-	20.1	-0.08

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	91
180	179
270	270

Calibrated by : *Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer



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Certificate of Calibration

Certificate No.: 28H710
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.AW.004/2548

Condition As-Received: Used Item

Received Date: 10 April 2026

Calibration Date: 17 April 2026

Reference: 2604-0316WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,
Bangkok 10260

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

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled-Mirror Hygrometer	Dew Master	41292	23277	06 May 2026
2) Handheld Thermometer With Sensor	1523	5717096	2511200	21 Nov 2026

2.The certificate is valid only to the item calibrated on date and place of calibration.
3.This measurement result is traceable to the International System of Unit maintained through:-
-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0
-Technology Promotion Association (Thailand-Japan), NSC-DNSC Accredited No. Calibration 0008

Calibrated by : Kraisep Onrat
Issue Date : 23 April 2026

Approved Signatory :
[] Chalot Waeewanjua
[] Pornthippa Tameyakul
[x] Viporn Tantiyawutti

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Certificate of Calibration

Certificate No.: 26P1519
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.AW.123/2550

Condition As-Received: Used Item

Received Date: 10 April 2026

Calibration Date: 22 April 2026

Reference: 2604-0316WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

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

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,
Bangkok 10260

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

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Indicator	DP1142	1422505046	MP-0150-25	20 May 2026

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

Calibrated by : Somchai Chalchan
Issue Date : 24 April 2026

Approved Signatory :
[] Phalinee Pratsapaal
[x] Sura Suwamasri
[] Atapol Panurach

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Cert. No.: 28H710
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	UUC* Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	0.1	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	2.0	1.9

Result of Calibration: Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	UUC* Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.5	-0.488	0.65
25.028	25.0	0.028	0.65
30.005	30.0	0.005	0.65
35.019	35.0	0.019	0.65
40.040	39.5	0.540	0.65

UUC* : Unit Under Calibration

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

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Cert.No.: 26P1519
Page: 2 of 2

Technical information and UUC* settings during calibration.

Result of calibration : Without adjustment
Pressure type : Absolute Pressure
Installation : Vertical Orientation
Atmospheric pressure : (1006 ± 10) mbar
Range : 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)
Pressure medium : Clean air
Reference level : at the center of the dial

Increasing Pressure

Applied Pressure (hPa)	954.50	966.01	977.33	988.29	999.08	1010.17	1021.66	1032.68
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	5.50	3.99	2.67	1.71	0.92	-0.17	-1.66	-2.68

Decreasing Pressure

Applied Pressure (hPa)	1032.67	1021.79	1010.29	999.07	988.40	977.64	966.87	954.39
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.67	-1.79	-0.29	0.93	1.60	2.36	4.13	5.61

The uncertainty of measurement was ± 0.25 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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CERTIFICATE OF CALIBRATION

Certificate No. : CDF-040-68

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISOH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3385
ID NUMBER : UAE-ETM-063/2560
CONDITION AS-RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 29 Aug 2025
MEASUREMENT DATE : 29 Sep 2025
ISSUE DATE : 30 Sep 2025

Calibration procedure:
The Orifice gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots Flow
Meter) Model G65/MC/W04p. The M-CI-004
was used as a calibration guide.

Traceability:
This certificate provides a traceability of the
measurement to recognized the national
standards and to realization of the international
system of units (SI) through the NIMT (National
Metrology Institute of Thailand) via Certificate
number NIMT-0016-25.

Uncertainty of Measurement:
The reported uncertainty of measurement is based
on the standard uncertainty multiplied by a
coverage factor $k=2$. Which for a normal
distribution corresponds to a coverage probability
of approximately 95%. The standard uncertainty
has been determined in accordance with the GUM
(Evaluation of measurement data - Guide to the
expression of uncertainty in measurement).

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:
Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.2 °C and 55.9 %RH.

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

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
☐ Mr. Sorapet Thachalad
☒ Mr. Watcharapol Subwat



Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-4649

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 22 August, 2025

Certification No. 394/25

Page : 1 of 7

Object : เครื่องวัดความเร็วลมอัตโนมัติ
Manufacturer : LSI
Type : Data Logger E-LOG 305 Wind speed DNA202 Wind direction DNA212
Thermoisigmeters DMA672.1 Barometer DQA 240.1
Mfg Code : Data Logger 17037713 Wind speed BQ1705627 Wind direction 19050292
Thermoisigmeters 24070483 Barometer R1605257
Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260.
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.5 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112
: Micromanometer Theodor Friedrichs FO014 Serial No. 9310119 : HOOK GAGE NO 1425
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 0 - 20 m/sec
STANDARD THERMOMETER : Theodor Friedrichs Dry No. 839094 Wet No. 838994
: Thermochneider No. D188 : testo, testo K64 Serial No. 12948057
STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1290015

Calibrated by: Watcharapol Subwat
Mr. Watcharapol Subwat
Mechanical Engineer

Signed:
Mr. Pichod Premrut
Mr. Pichod Premrut

Authorized Signatory
For the Chief
Sub-Standard Instrument

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Continuation of Certificate of Calibration Number CDF-040-68

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C]	Temperature [°F]	Ap_meter mmHg	Ap_Orifice inH ₂ O	F	Standard Flow [Q _s] m ³ /min
1	0.704	753.311	22.97	73.35	56.514	1.532	1.229	0.652
2	1.001	753.266	22.99	73.37	62.412	1.034	1.734	0.918
3	1.116	753.254	23.08	73.48	41.501	1.969	1.390	1.054
4	1.164	753.258	23.09	73.55	29.909	4.424	2.103	1.117
5	1.410	753.191	23.04	73.46	28.108	6.537	2.554	1.356

Slope (m): 1.87959
Intercept (b): 0.00567
Correlation coefficient (r): 0.99982
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C]	Temperature [°F]	Ap_meter mmHg	Ap_Orifice inH ₂ O	F	Standard Flow [Q _s] m ³ /min
1	0.704	753.311	22.97	73.35	56.514	1.532	0.771	0.653
2	1.001	753.266	22.99	73.37	62.412	1.034	1.086	0.920
3	1.116	753.254	23.08	73.48	41.501	1.969	1.349	1.056
4	1.164	753.258	23.09	73.55	29.909	4.424	1.519	1.120
5	1.410	753.191	23.04	73.46	28.108	6.537	1.603	1.359

Slope (m): 1.17726
Intercept (b): 0.00356
Correlation coefficient (r): 0.99982
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-4649

The Result of Calibration

22 August, 2025
Certification No. 394/25
Page : 2 of 7

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.9	0.12
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.9	0.12

Vane Angel Bench Stand Model 18112 Young Meteorological Instruments	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by: Watcharapol Subwat
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 394/25

22 August, 2025

Page : 3 of 7

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1009.20	1008.96	0.22
1009.04	1008.85	0.19
1008.82	1008.72	0.10
1008.65	1008.58	0.07
1008.46	1008.45	0.01
1008.15	1008.05	0.10
1007.64	1007.52	0.12
1007.43	1007.25	0.18
1007.27	1007.12	0.15
1007.04	1006.98	0.06
1006.49	1006.32	0.11
1006.21	1006.18	0.03
1006.62	1006.45	0.17
1006.41	1006.32	0.09
1006.09	1006.05	0.04
1007.58	1007.52	0.06
1007.32	1007.25	0.07
1007.12	1006.98	0.14
1006.84	1006.72	0.12
1006.28	1006.18	0.10

Average

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 394/25

22 August, 2025

Page : 5 of 7

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.14	45.21	-0.07
30.25	30.31	-0.06
15.24	15.32	-0.08

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 394/25

22 August, 2025

Page : 4 of 7

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
756.96	756.8	0.16
756.84	756.7	0.14
756.68	756.6	0.08
756.55	756.5	0.05
756.41	756.4	0.01
756.17	756.1	0.07
756.79	756.7	0.09
756.63	756.5	0.13
756.51	756.4	0.11
756.34	756.3	0.04
754.88	754.8	0.08
754.72	754.7	0.02
756.53	756.4	0.13
756.37	756.3	0.07
756.13	756.1	0.03
756.75	756.7	0.05
756.56	756.5	0.05
756.40	756.3	0.10
756.19	756.1	0.09
754.77	754.7	0.07

Average

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 394/25

22 August, 2025

Page : 6 of 7

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
95.53	97.6	-2.07
65.24	66.5	-1.26
44.12	44.9	-0.78

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



Date of Issue 22 August, 2025

Certification No. 394/25

Page: 7 of 7

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ซีอีโอ LSI LASTEM แบบ TIPPING BUCKET
Code: DQA230.1 Serial No.19050180 ทำการสอบเทียบกับแก้ววัดฝนแบบแก้วดวง GAUGE
DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถ
นำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ:

(นายวัชรพล ทวีพัฒน์)

วิศวกรชำนาญการ

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 2 of 7

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H ₂ O	inches H ₂ O	m/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.9	0.12
13.01	-	-	-	13.6	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.9	0.12

Vane Angel Bench Stand Model 18112	
Young Meteorological Instruments	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



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 22 August, 2025

Certification No. 395/25

Page : 1 of 7

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : LSI

Type : Data Logger E-LOG-305 Wind speed DNA202 Wind direction DNA212
Thermogrometers DMA672.1 Barometer DQA 240.1

Mfg Code : Data Logger 17037708 Wind speed BQ1705626 Wind direction19020250
Thermogrometers 24070579 Barometer R1605260

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.9 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112
: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425
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 0 - 20 m/sec.

STANDARD THERMOMETER : Theodor Friedrich: Dry No.8390/94 Wet No. 8389/94
: Thermoschneider No.9188 : testo, testo 845 Serial No. 02848057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1229015

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Signed:
Mr. Pisoot Promsat



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 3 of 7

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1009.20	1009.12	0.08
1009.04	1008.98	0.06
1008.82	1008.85	-0.03
1008.65	1008.72	-0.07
1008.46	1008.45	0.01
1008.15	1008.18	-0.03
1007.64	1007.52	0.12
1007.43	1007.38	0.05
1007.27	1007.25	0.02
1007.04	1006.98	0.06
1006.43	1006.45	-0.02
1006.21	1006.32	-0.11
1006.62	1006.58	0.04
1006.41	1006.32	0.09
1006.09	1006.05	0.04
1007.58	1007.52	0.06
1007.32	1007.25	0.07
1007.12	1006.98	0.14
1006.84	1006.85	-0.01
1006.28	1006.32	-0.04

Average

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 4 of 7

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
756.96	756.9	0.06
756.84	756.8	0.04
756.68	756.7	-0.02
756.55	756.6	-0.05
756.41	756.4	0.01
756.17	756.2	-0.03
755.79	755.7	0.09
755.63	755.6	0.03
755.51	755.5	0.01
755.34	755.3	0.04
754.88	754.9	-0.02
754.72	754.8	-0.08
756.53	756.5	0.03
756.37	756.3	0.07
756.13	756.1	0.03
755.75	755.7	0.05
755.55	755.5	0.05
755.40	755.3	0.10
755.19	755.2	-0.01
754.77	754.8	-0.03

Average

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 6 of 7

Standard Humidity	Relative Humidity Sensor Reading	
	Reading	Correction
% R.H.	% R.H.	% R.H.
95.53	97.1	-1.57
65.24	66.1	-0.86
44.12	44.5	-0.38

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 5 of 7

Standard Temp.	Temperature Sensor Reading	
	Reading	Correction
°C	°C	°C
45.14	45.24	-0.10
30.25	30.34	-0.09
15.24	15.29	-0.05

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



Date of Issue 22 August, 2025

Certification No. 395/25

Page: 7 of 7

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ LSI LASTEM แบบ TIPPING BUCKET Code. DQA230.1#C Serial No. PC1705209 ทำการสอบเทียบกับแก้ววัดฝนแบบแก้ววง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และ สามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ *ว.จ.ว.ร.*
(นายวัชรพล ทรัพย์วัฒน์)
วิศวกรชำนาญการ

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12890/UM12890 [UAE.EFM.026/2561]
CLID. NO. : 251900038
JOB CONTROL NO. : 250719084760
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED : 24 July 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yoitsontorn
Authorized Signatory
24 July 2025

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. Q25084760

F3-011-05/12-23

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.397	+0.003	1.3
0.5	50 Hz		0.500	0.495	+0.005	1.3
0.6	50 Hz		0.600	0.592	+0.008	2.5
0.7	50 Hz		0.700	0.689	+0.011	2.5
0.3	100 Hz	peak	0.300	0.299	+0.001	1.9
0.4	100 Hz		0.400	0.397	+0.003	1.3
0.5	100 Hz		0.500	0.495	+0.005	1.3
0.6	100 Hz		0.600	0.593	+0.007	2.5
0.7	100 Hz		0.700	0.691	+0.009	2.5

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	3.023	-0.023	1.8
4	50 Hz		4.000	4.043	-0.043	1.8
5	50 Hz		5.000	5.052	-0.052	1.8
6	50 Hz		6.000	6.063	-0.063	1.8
7	50 Hz		7.000	7.072	-0.072	1.8
3	100 Hz	peak	3.000	3.008	-0.008	2.7
4	100 Hz		4.000	4.012	-0.012	1.3
5	100 Hz		5.000	5.019	-0.019	1.3
6	100 Hz		6.000	6.023	-0.023	1.0
7	100 Hz		7.000	7.031	-0.031	1.0

Certificate No. Q25084760

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12890/UM12890 [UAE.EFM.026/2561]
DATE OF CALIBRATION : 19 July 2025

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, Programmable Timer/Counter and Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 243-4988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

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:2022)"

Certificate No. Q25084760

F3-011-05/12-23

เอกสารไม่ควบคุม



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	1.4
0.06	50 Hz		0.060	0.061	-0.001	1.3
0.07	50 Hz		0.070	0.071	-0.001	1.1
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	1.4
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.1

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

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

End of Certificate

Certificate No. Q25084760

F3-011-05/12-23

เอกสารไม่ควบคุม





CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230[UAE.EFM.029/2559]
CLID. NO. : 251701315
JOB CONTROL NO. : 251222149760
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 22 December 2025

DATE OF ISSUED : 25 December 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
25 December 2025

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. Q25149760
F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230[UAE.EFM.029/2559]
DATE OF CALIBRATION : 23 December 2025

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, Programmable Timer/Counter and Vibration Calibrator with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-090-25, Due Date 31 July 2026.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AY-0030-24, Due Date 22 July 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$ 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:2022)"

Certificate No. Q25149760
F3-011-05/12-23

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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)	$\pm$ (% 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	1.6
0.5	50 Hz		0.500	0.507	-0.007	1.6
0.6	50 Hz		0.600	0.608	-0.008	2.5
0.7	50 Hz		0.700	0.710	-0.010	2.5
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.6
0.5	100 Hz		0.500	0.506	-0.006	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	$\pm$ (% of rdg.)
3	50 Hz	peak	3.000	3.029	-0.029	1.8
4	50 Hz		4.000	4.038	-0.038	1.8
5	50 Hz		5.000	5.067	-0.067	1.8
6	50 Hz		6.000	6.076	-0.076	1.8
7	50 Hz		7.000	7.089	-0.089	1.8
3	100 Hz	peak	3.000	3.029	-0.029	1.6
4	100 Hz		4.000	4.039	-0.039	1.6
5	100 Hz		5.000	5.045	-0.045	1.6
6	100 Hz		6.000	6.059	-0.059	1.5
7	100 Hz		7.000	7.068	-0.068	1.5

Certificate No. Q25149760
F3-011-05/12-23

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	$\pm$ (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 1,2 of 73

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

End of Certificate

Certificate No. Q25149760
F3-011-05/12-23

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Certificate No : 25-SLM-241
Request No : Req-2025-1240

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A (dB)	C (dB)	Z (dB)	
FAST / 37-139				0.20
STD Setting				
63 Hz	0.2	0.2	0.2	
125 Hz	0.1	0.2	0.2	
250 Hz	0.0	0.3	0.1	
500 Hz	0.0	0.1	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	-0.1	-0.1	-0.1	
8000 Hz	-0.2	-0.2	-0.1	
16000 Hz	-0.2	-0.2	-0.3	

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
FAST / 37-139				0.20
UUC Weighting				
A	114.00	114.0	0.0	
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
37-139 / A				0.20
UUC Time Response				
Fast	114.00	114.0	0.0	
Slow	114.00	114.0	0.0	
Leq	114.00	114.0	0.0	

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

PM-708-SLM-01 Rev.00 Issue date 17/2/21

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Certificate No : 25-SLM-241
Request No : Req-2025-1240

9. Level linearity including the level range control

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
FAST / A				0.20
UUC Range				
37-139	42.00	42.1	0.1	

10. Tone burst response

UUC Setting	STD Toneburst	Anticipated Ref	Measured		UNCERTAINTY (± dB)
			UUC (dB)	ERR (dB)	
A / 37-139					0.20
UUC Time Response	(ms)				
Fast	200	135.0	134.9	-0.1	
	2	118.0	117.9	-0.1	
Slow	0.25	109.0	108.7	-0.3	
	200	128.6	128.4	-0.2	
SEL	2	109.0	108.8	-0.2	
	200	129.0	129.0	0.0	
	2	109.0	109.1	+0.1	
	0.25	100.0	99.9	-0.1	

11. Peak C Sound level

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

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PM-708-SLM-01 Rev.00 Issue date 17/2/21

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

7. Long Term Stability

UUC Setting	Measured UUC	UNCERTAINTY (± dB)
FAST / A / 37-139		0.10
STD Setting	(dB)	
Initial	114.0	
Final	114.0	
Deviated	0.0	

8. Level linearity on the reference level range

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
FAST / A / 37-139				0.20
STD dB	(dB)			
139.00	139	139.0	0.0	
134.00	134	134.0	0.0	
129.00	129	129.0	0.0	
124.00	124	124.0	0.0	
119.00	119	119.0	0.0	
114.00	114	114.0	0.0	
109.00	109	109.0	0.0	
104.00	104	104.0	0.0	
99.00	99	99.0	0.0	
94.00	94	93.9	-0.1	
89.00	89	88.9	-0.1	
84.00	84	83.9	-0.1	
79.00	79	78.9	-0.1	
74.00	74	73.9	-0.1	
69.00	69	68.9	-0.1	
64.00	64	63.9	-0.1	
59.00	59	58.9	-0.1	
54.00	54	54.0	0.0	
49.00	49	49.0	0.0	
44.00	44	44.0	0.0	
39.00	39	39.2	0.2	
38.00	38	38.3	0.3	
37.00	37	37.4	0.4	
36.00	36	36.5	0.5	

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

PM-708-SLM-01 Rev.00 Issue date 17/2/21

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Certificate No : 25-SLM-241
Request No : Req-2025-1240

12. Overload indication

UUC Setting	Measured UUC	UNCERTAINTY (± dB)
FAST / A / 37-139		0.20
STD Setting	(dB)	
Positive one-half cycle	140.8	
Negative one-half cycle	140.6	
Deviated	0.2	

13. High Level Stability

UUC Setting	Measured UUC	UNCERTAINTY (± dB)
FAST / A / 37-139		0.10
STD Setting	(dB)	
Initial	138.0	
Final	138.0	
Deviated	0.0	

End of Certificate

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

PM-708-SLM-01 Rev.00 Issue date 17/2/21

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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-SLM-242
Address : 81 Soi Udomsak 41, Sakdumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2025-1241

Unit Under Calibration Details

Measurement Item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LxT2 Microphone SN : 011731
Serial Number : 0005288 Preamplifier Model : PRMLxT2B
ID : UAE.EFM.1042562 Preamplifier SN : 056075
Resolution : 0.1 dB 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 : 16 July 2025
Calibrated Date : 29 July 2025
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
Multifunction Acoustic Calibrator	Brüel&Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	Svante	Svan901	131	15 October 2025	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. Nopadon Luangrat
Service Calibration Engineer

Approved By : 
Mr. Pacht Mathavorn
Calibration Engineer Supervisor
Issue Date : 29 July 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-008-SLM-01 Rev.00 Issue date 17/2/25

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Certificate No : 25-SLM-242
Request No : Req-2025-1241

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY
FAST / 37-139	Weighting Response curve			
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)
63 Hz	-0.1	0.0	0.0	0.20
125 Hz	-0.1	0.1	0.0	
250 Hz	-0.1	0.0	0.0	
500 Hz	0.0	0.1	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.1	0.1	0.0	
4000 Hz	0.0	0.1	0.1	
8000 Hz	0.0	0.0	0.1	
16000 Hz	0.0	0.0	-0.1	

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY
		UUC	ERR	
FAST / 37-139	REF			0.20
UUC Weighting	(dB)			
A	114.00	114.0	0.0	
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD	Measured		UNCERTAINTY
		UUC	ERR	
37-139 / A	REF			0.20
UUC Time Response	(dB)			
Fast	114.00	114.0	0.0	
Slow	114.00	114.0	0.0	
Leq	114.00	114.0	0.0	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-008-SLM-01 Rev.00 Issue date 17/2/25

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Certificate No : 25-SLM-242
Request No : Req-2025-1241

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY
		UUC	ERR	UUC	ERR	
FAST / A / 37-139	Level					(± dB)
Calibrator Setting	(dB)					
1000 Hz 114 dB	114.68	115.2	0.52	114.7	0.02	

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN, AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.8	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	30.6	0.10
C	30.2	0.10
Z	34.3	0.10

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY
	Weighting Response curve			
	A	C	Z	
FAST / 37-139				(± dB)
STD Setting	(dB)	(dB)	(dB)	
125 Hz	0.1	0.1	0.1	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	1.6	1.6	1.6	0.60
8000 Hz	2.2	2.2	2.3	0.70

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-008-SLM-01 Rev.00 Issue date 17/2/25

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Certificate No : 25-SLM-242
Request No : Req-2025-1241

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	
STD Setting	(dB)	(± dB)
Initial	114.0	0.10
Final	114.0	
Deviated	0.0	

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY
		UUC	ERR	
FAST / A / 37-139	REF			0.30
STD dB	(dB)			
139.00	139	139.0	0.0	
134.00	134	134.0	0.0	
129.00	129	129.0	0.0	
124.00	124	124.0	0.0	
119.00	119	119.0	0.0	
114.00	114	114.0	0.0	
109.00	109	109.0	0.0	
104.00	104	104.0	0.0	
99.00	99	99.0	0.0	
94.00	94	94.0	0.0	
89.00	89	89.0	0.0	
84.00	84	84.0	0.0	
79.00	79	79.0	0.0	
74.00	74	74.0	0.0	
69.00	69	69.0	0.0	
64.00	64	64.0	0.0	
59.00	59	59.0	0.0	
54.00	54	54.1	0.1	
49.00	49	49.1	0.1	
44.00	44	44.2	0.2	
40.00	40	40.3	0.3	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-008-SLM-01 Rev.00 Issue date 17/2/25

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Cert.No.: 25CH1183

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Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	25440	16 Apr 2026
2) Ref. Std. Thermometer	4982054	110RC044	251708	03 July 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1413.5 µS/cm	CPA Chem	1135361	16 Aug 2026
12.881 mS/cm	CPA Chem	1081099	11 Mar 2026

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results**Function :** Conductivity Measurement

(*) After Adjustment at 1413.5 µS/cm

Conductivity Electrode Serial No.: 18L100008

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ($\pm$)	Coverage factor k
1413.5 µS/cm	1415 µS/cm	1414 µS/cm	9.2 µS/cm	2.00
12.881 mS/cm	12.91 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration

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Cert.No.: 25CH1183

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Calibration Results**Function :** Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PRO30 COND-T
- Serial No. : 18L100008

Dimension of probe;

- Length : 93.6 mm
- Diameter : 2.7 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement ($\pm$ °C)	Coverage factor k
15.0	15.002	14.9	-0.102	0.13	2.00
30.0	30.002	29.9	-0.102	0.13	2.00
45.0	45.001	44.9	-0.102	0.13	2.00

Remark : - UUC* = Unit Under CalibrationThe 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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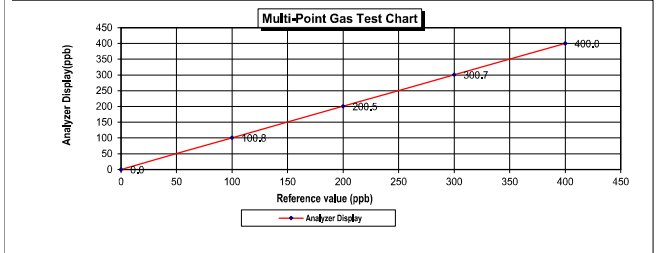
MULTI-POINT GAS TEST REPORT**Test Date :** Feb 17, 2026

Equipment :	Gas Analyzer (NO ₂)	Model :	42i
Manufacturer :	Thermo Scientific	Serial Number :	CM22387035

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

	Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.8	0.80	0.79	0.79
Level 3	40.00%	200.0	200.5	0.50	0.25	0.25
Level 4	60.00%	300.0	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.26
			Acceptable Limit $\pm$ 5%			



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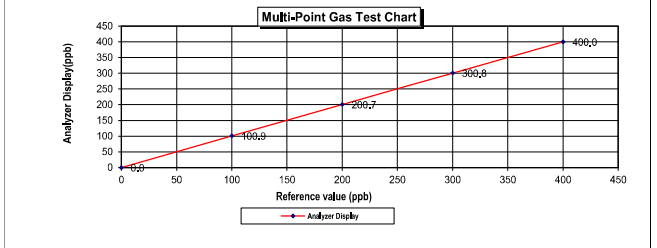
MULTI-POINT GAS TEST REPORT**Test Date :** Feb 17, 2026

Equipment :	Gas Analyzer (NO ₂)	Model :	42i
Manufacturer :	Thermo Scientific	Serial Number :	CM08130002

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

	Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.30
			Acceptable Limit $\pm$ 5%			



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MULTI-POINT GAS TEST REPORT

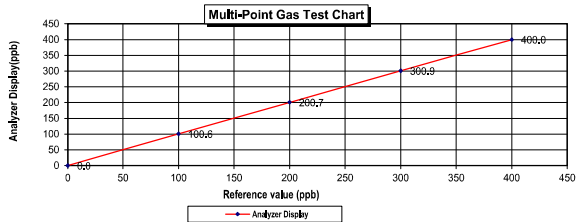
Test Date : Feb 20, 2026

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,0	0,00	0,00	0,00
Level 2	20.00%	100,0	100,6	0,60	0,60	0,60
Level 3	40.00%	200,0	200,7	0,70	0,35	0,35
Level 4	60.00%	300,0	300,9	0,90	0,30	0,30
Level 5	80.00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb	Average Difference (%)			0,25



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MULTI-POINT GAS TEST REPORT

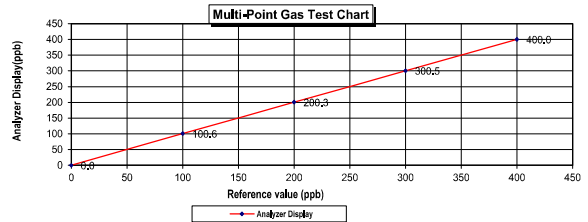
Test Date : Feb 24, 2026

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050150

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,0	0,00	0,00	0,00
Level 2	20,00%	100,0	100,6	0,60	0,60	0,60
Level 3	40,00%	200,0	200,3	0,30	0,15	0,15
Level 4	60,00%	300,0	300,5	0,50	0,17	0,17
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range			500,0 ppb	Average Difference (%)		0,18



Calculate by

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Approve by

24 Feb 2026



MULTI-POINT GAS TEST REPORT

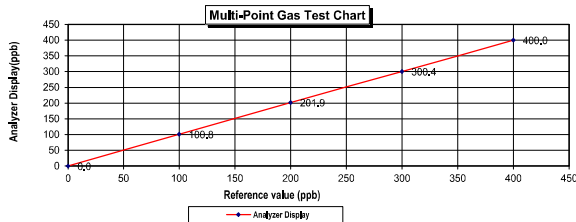
Test Date : Feb 24, 2026

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050149

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,0	0,00	0,00	0,00
Level 2	20.00%	100,0	100,8	0,80	0,79	0,79
Level 3	40.00%	200,0	201,9	1,90	0,94	0,94
Level 4	60.00%	300,0	300,4	0,40	0,13	0,13
Level 5	80.00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb		Average Difference (%)		0,37



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24 Feb 2026



CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND) LTD
Part Number: E04N199E15A01D3
Cylinder Number: EB0159156
Laboratory: 124 - Durham (SAP) - NC
PGVP Number: B22023
Gas Code: CO, NO, NOX, SO₂, BALN
Reference Number: 122-402880224-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Nov 06, 2023
Expiration Date: Nov 06, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Common Calibration Standards (May 2017) and EPA 800/5-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration standard. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

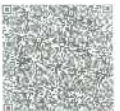
ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	46.78 PPM	G1	$\pm$ 1.3% NIST Traceable
NITRIC OXIDE	45.00 PPM	46.77 PPM	G1	$\pm$ 1.3% NIST Traceable
SULFUR DIOXIDE	45.00 PPM	43.89 PPM	G1	$\pm$ 1.0% NIST Traceable
CARBON MONOXIDE	1000 PPM	965.9 PPM	G1	$\pm$ 0.7% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	21060703	CC707954	48.41 PPM NITRIC OXIDE/NITROGEN	$\pm$ 1.2%
PRM		D913660	15.01 PPM NITROGEN DIOXIDE/AIR	$\pm$ 1.5%
GMIS	124206889	CC322889	4.573 PPM NITROGEN DIOXIDE/NITROGEN	$\pm$ 1.6%
NTRM	18061005	CC473180	49.02 PPM SULFUR DIOXIDE/NITROGEN	$\pm$ 0.8%
NTRM	14060154	CC436961	990.9 PPM CARBON MONOXIDE/NITROGEN	$\pm$ 0.6%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 AUP2010349 CO	FTIR	Oct 11, 2023
Nicolet iS50 AUP2010249 NO	FTIR	Oct 11, 2023
Nicolet iS50 AUP2010249 NO2	FTIR	Oct 11, 2023
Nicolet iS50 AUP2010249 SO2	FTIR	Oct 11, 2023

Triad Data Available Upon Request

NOTES: GROSS WEIGHT: 28.4 kg
NET WEIGHT: 4.7 kg



MULTI-POINT GAS TEST REPORT

Test Date : Feb 23, 2026

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906875

Standard Gas Concentration

Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 965.9 PPM
Cylinder No. : EB01159156
Expiration Date : Nov 06, 2026

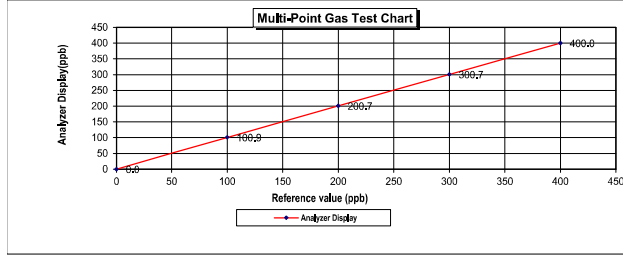
Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb
:Acceptable Limit $\pm 5\%$



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23/02/2026

CERTIFICATE OF CALIBRATION

Certificate No. : CDF-046-68

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER : TISCH
MODEL/TYPE : TC-5025A
SERIAL NUMBER : 3541
ID NUMBER : UAE-EFM-177/2561
CONDITION AS-RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

RECEIVED DATE : 20 Oct 2025
MEASUREMENT DATE : 30 Oct 2025
ISSUE DATE : 30 Oct 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 $\pm$ 3.0 °C
Relative Humidity : 55.0 $\pm$ 15.0 %RH
Atmospheric Pressure : 1010 $\pm$ 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 22.9 °C and 51.5 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/MC/MQ-0p. The W-CL-004 was used as a calibration guideline.

Traceability:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'.

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'.

Calibrated by:

☐ Mr. Sorapong Thachakul
☒ Miss Jitpiporn Lertsamphol



Approved signature:

Mr. Parinya Booncharoen
Calibration Department Manager

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

Continuation of Certificate of Calibration Number CDF-046-68

Page 2 of 2 Pages

MULTI-POINT GAS TEST REPORT

Test Date : May 6, 2025

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387067

Standard Gas Concentration

Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 965.9 PPM
Cylinder No. : EB01159156
Expiration Date : Nov 06, 2026

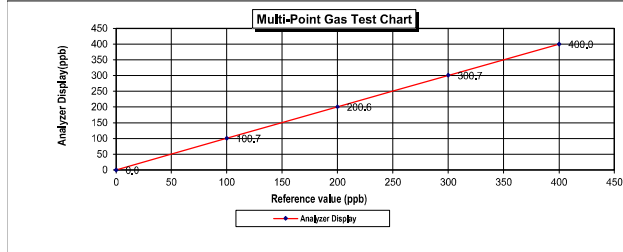
Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.6	0.60	0.30
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb
:Acceptable Limit $\pm 5\%$



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6/05/2025

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6/ May 2025

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Δp_{meter} mmHg	$\Delta p_{orifice}$ mmHg	γ	Standard Flow [Q _s] m ³ /min
1	0.707	756.239	22.82	21.98	57.881	1.726	1.915	0.656
2	1.001	756.198	22.79	22.22	61.350	3.424	1.853	0.923
3	1.116	756.152	23.30	22.72	41.184	4.509	2.124	1.057
4	1.169	756.110	23.30	22.77	30.459	5.085	2.256	1.125
5	1.414	756.090	23.37	22.86	29.934	7.544	2.747	1.361

Slope (a): 2.03939
Intercept (b): -0.01895
Correlation coefficient (r): 0.99976
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Δp_{meter} mmHg	$\Delta p_{orifice}$ mmHg	γ	Standard Flow [Q _s] m ³ /min
1	0.707	756.239	22.82	21.98	57.881	1.726	0.822	0.654
2	1.001	756.198	22.79	22.22	61.350	3.424	1.158	0.921
3	1.116	756.152	23.30	22.72	41.184	4.509	1.330	1.057
4	1.169	756.110	23.30	22.77	30.459	5.085	1.412	1.124
5	1.414	756.090	23.37	22.86	29.934	7.544	1.720	1.360

Slope (a): 1.27036
Intercept (b): -0.01181
Correlation coefficient (r): 0.99976
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CDF-040-68

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER : Tip Load Orifice
MODEL/TYPE : TISCH
SERIAL NUMBER : TE-5025A
ID NUMBER : 3383
CONDITION AS-RECEIVED : UAE-ETM-063/2560
CUSTOMER : Used item
United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 29 Aug 2025
MEASUREMENT DATE : 29 Sep 2025
ISSUE DATE : 30 Sep 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Pre-conditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.2 °C and 55.9 %RH.

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

TABULATION OF RESULTS:

The table on each page gives the measured values.

Calibration procedure:
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/Whelp. The W-CL-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognize the national standards and to realize the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: NM-0016-25.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM. Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

Calibrated by:
☐ Mr. Somchai Thachalad
☒ Mr. Jiraporn Lertsapongkul



Approved signatory:
Mr. Perinya Booncharoim
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS GIVEN IN WRITING FROM THE LABORATORY

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Feb 20, 2026

Equipment : Gas Analyzer (NO₂) **Model :** 42i
Manufacturer : Thermo Scientific **Serial Number :** CM19050148

Standard Gas Concentration

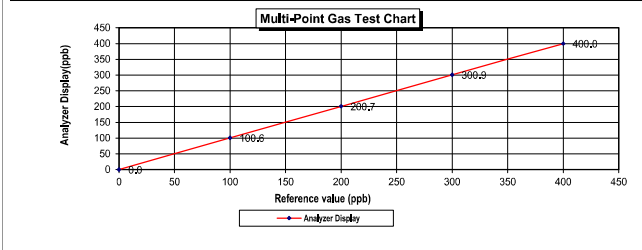
Sulphur Dioxide (SO₂) : 42.89 PPM
Nitric Oxide (NO) : 46.77 PPM
Methane (CH₄) : - PPM
Carbon Monoxide (CO) : 965.9 PPM
Cylinder No. : EB0159156
Expiration Date : Nov 6, 2026

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.6	0.60	0.60	0.60
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark :	Measuring Range : 500.0 ppb		Average Difference (%)		0.25
	:Acceptable Limit ± 5%				



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20 / Feb / 2026

Page 1 of 1

เอกสารไม่ควบคุม

Continuation of Certificate of Calibration Number CDF-040-68

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C] [°F]	Temperature [°C] [°F]	Ap_meter mmHg	Ap_Office mmHg	r	Standard Flow [Q] m ³ /min
1	0.704	753.311	22.87	22.08	56.514	1.532	1.226	0.953
2	1.001	753.266	22.89	22.37	62.412	3.014	1.734	0.918
3	1.116	753.254	23.08	22.48	41.501	3.969	1.990	1.054
4	1.164	753.256	23.09	22.55	28.809	4.424	2.103	1.117
5	1.410	753.191	23.04	22.66	28.108	6.537	2.554	1.356

Slope (m): 1.87959
Intercept (b): 0.00567
Correlation coefficient (r): 0.99982
Uncertainty (a=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C] [°F]	Temperature [°C] [°F]	Ap_meter mmHg	Ap_Office mmHg	r	Standard Flow [Q] m ³ /min
1	0.704	753.311	22.87	22.08	56.514	1.532	0.771	0.953
2	1.001	753.266	22.89	22.37	62.412	3.014	1.088	0.920
3	1.116	753.254	23.08	22.48	41.501	3.969	1.240	1.054
4	1.164	753.256	23.09	22.55	29.909	4.424	1.318	1.120
5	1.410	753.191	23.04	22.66	28.108	6.537	1.603	1.359

Slope (m): 1.17726
Intercept (b): 0.00356
Correlation coefficient (r): 0.99982
Uncertainty (a=2): 0.015 m³/min

End of Certificate of Calibration



เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : May 7, 2025

Equipment : Gas Analyzer (NO₂) **Model :** 42i
Manufacturer : Thermo Scientific **Serial Number :** 1182920009

Standard Gas Concentration

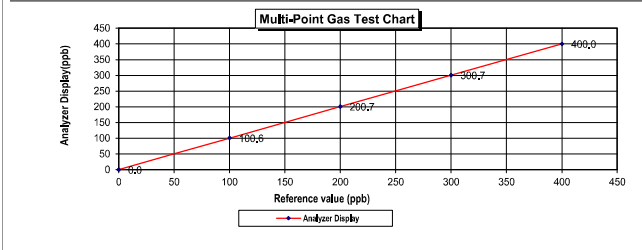
Sulphur Dioxide (SO₂) : 42.89 PPM
Nitric Oxide (NO) : 46.77 PPM
Methane (CH₄) : - PPM
Carbon Monoxide (CO) : 965.9 PPM
Cylinder No. : EB0159156
Expiration Date : Nov 6, 2026

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.6	0.60	0.60	0.60
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.9	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark :	Measuring Range : 500.0 ppb		Average Difference (%)		0.24
	:Acceptable Limit ± 5%				



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7 / May / 2025

Page 1 of 1

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014
Cylinder Number: E80182121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO2, NO, NOX, SO2, BALN

Reference Number: 180-40272205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 680
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" (May 2012) document EPA 800R-12(03), using the assay procedure listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e., 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	C2219101	AP61514048	100.16 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%
GMIS	153400202002	E80130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
CO	230601	CC745902	245.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%
NTRM	130606-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.8%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014
Cylinder Number: E80182121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO2, NO, NOX, SO2, BALN

Reference Number: 180-40272205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 680
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" (May 2012) document EPA 800R-12(03), using the assay procedure listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e., 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	C2219101	AP61514048	100.16 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%
GMIS	153400202002	E80130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
CO	230601	CC745902	245.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%
NTRM	130606-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.8%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

เอกสารไม่ควบคุม

United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uaec@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : May 7, 2025

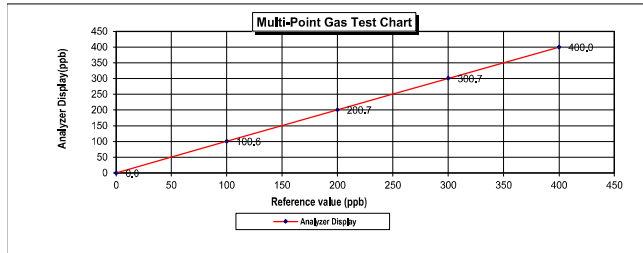
Equipment : Gas Analyzer (NO2) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920009

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO2)	42.89 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77 PPM	Model :	146i
Methane (CH4)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9 PPM		
Cylinder No. :	E80159156		
Expiration Date :	Nov 6, 2026		

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.6	0.60	0.60	0.60
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb
:Acceptable Limit $\pm$ 5%



Calculate by

7 / 05 / 2025

Approve by

7 / May / 2025

เอกสารไม่ควบคุม

United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uaec@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : July 17, 2025

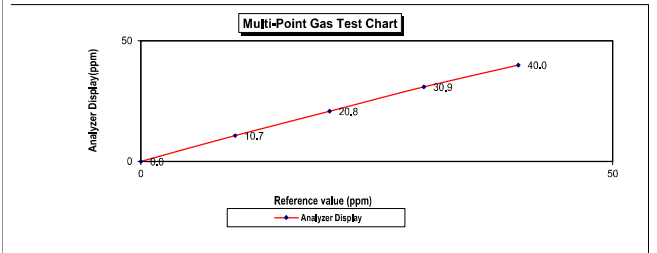
Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO2)	42.89 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77 PPM	Model :	146i
Methane (CH4)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9 PPM		
Cylinder No. :	E80159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.7	0.7	6.5	6.5
Level 3	40.00%	20.8	0.8	3.8	3.8
Level 4	60.00%	30.9	0.9	2.9	2.9
Level 5	80.00%	40.0	0.0	0.0	0.0

Remark : Measuring Range 50.0 ppm
:Acceptable Limit $\pm$ 5%



Calculate by

17 / 07 / 2568

Approve by

17 / July / 2025

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

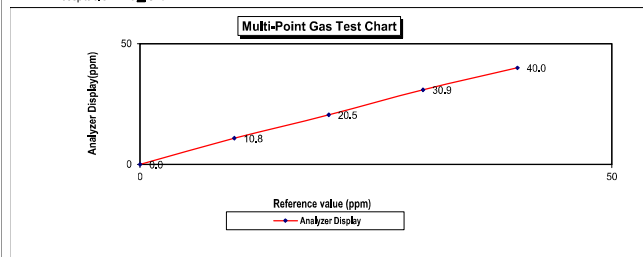
Test Date : July 29, 2025

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201778118

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9	PPM		
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

	Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.8	0.8	7.4	7.4
Level 3	40.00%	20.0	20.5	0.5	2.4	2.4
Level 4	60.00%	30.0	30.9	0.9	2.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range 50.0 ppm				Average Difference (%)		
: Acceptable Limit $\pm 5\%$				2.55		



Calculate by

Approve by

29 / 07 / 2568

29 / July / 2025

Page 1 of 1

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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 : 7 May, 2026

Certification No. : 263/26

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI Lastem ID No. : UAE.EFM.121/2563

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

Serial No. : Dato Logger 20040004 wind speed and wind direction 20040163

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 1008.2 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: 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 0 - 20 m/sec

Calibrated by : Watchapol Subwat

Signed : Mr. Pisod Promsut

Mechanical Engineer

Authorised Signatory

For the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.
Part Number: E05N191E15A0014 Reference Number: 160-402772205-1
Cylinder Number: E05182121 Cylinder Volume: 144.0 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2016 PSIG
PGVP Number: A12023 Valve Outlet: 650
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" (May 2012) document EPA 800R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results shall only be used for the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder before 100 ppm, i.e., 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	100.0 PPM	100.4 PPM	G1	$\pm 0.9\%$ NIST Traceable
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	$\pm 0.9\%$ NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	$\pm 1.4\%$ NIST Traceable
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	$\pm 0.3\%$ NIST Traceable
CARBON DIOXIDE	8.000 %	7.982 %	G1	$\pm 1.2\%$ NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
GMS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$
PRM	C2219101	AP61514548	100.16 PPM NITRIC OXIDE/NITROGEN	$\pm 0.3\%$
GMS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$
PRM	12409	D913680	15.01 PPM NITROGEN DIOXIDE/AIR	$\pm 1.5\%$
GMS	1534002002	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	$\pm 1.6\%$
NTRM	160102-22	KAL03820	97.69 PPM SULFUR DIOXIDE/NITROGEN	$\pm 0.8\%$
CO	230601	CC745562	245.47 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.3\%$
NTRM	130806-02	CC411730	13.558 % CARBON DIOXIDE/NITROGEN	$\pm 0.8\%$

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

เอกสารไม่ควบคุม

THAI METEOROLOGICAL DEPARTMENT



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

The Result of Calibration

Certification No. 263/26

7 May, 2026

Page : 2 of 2

Standard	HOOK GAGE NO. 1425		TESTED ANEMOMETER		
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.1	-0.09
17.02	-	-	-	17.0	0.03
20.02	-	-	-	20.1	-0.08

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

WIND DIRECTION		TESTED WIND DIRECTION	
0		0	
90		90	
180		180	
270		270	

Calibrated by : Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom suk 41, Sukhumvit Rd., Bang Chak, Phar Khanong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S/FACT

Serial No.: 1129361010

Asset No.: UAE.WAS.002/2552

Building: N/A Floor: 1 Room: 107

Received Date: April 22, 2025

Date of Calibration: April 23, 2025

Calibration Conditions: Temperature 22.8 °C to 23.4 °C
Humidity 54.8 % to 68.9 %
Pressure 756.6 mmHg to 758.2 mmHg

Calibrated by: Sakkarin Srirahang

Approved by: Suwit Chotnok

Signature:

Issued Date: April 25, 2025

Note: 1) The Uncertainties are for a confidence probability of approximately 95%

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

3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

เอกสารไม่ควบคุม

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 3 of 3

Equipment: Electronic Balance

Model: AB204 S/FACT

Serial No.: 1129361010

Max. Capacity: 220 g

Calibration Date: April 23, 2025

Manufacturer: Mettler Toledo

Readability: 0.0001 g

ID No.: UAE.WAS.002/2552

Calibration Result: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Error of indication from nominal or conventional mass value:

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unload	0.000000	0.0000	0.0000	0.10	2.05
0.01	0.0100025	0.0099	0.0001	0.10	2.05
0.05	0.0500054	0.0500	0.0000	0.10	2.05
0.1	0.1000012	0.0998	0.0001	0.10	2.05
0.5	0.5000193	0.5000	0.0000	0.10	2.05
1	1.0000105	1.0000	0.0000	0.10	2.05
10	10.000010	10.0000	0.0000	0.11	2.04
40	40.000076	40.0000	0.0000	0.14	2.00
50	50.000036	50.0000	0.0001	0.13	2.00
80	80.000107	80.0000	0.0001	0.18	2.00
100	100.000109	99.9999	0.0002	0.17	2.00
120	120.00015	119.9999	0.0003	0.21	2.00
150	150.000145	149.9998	0.0003	0.24	2.00
160	160.000175	159.9997	0.0005	0.26	2.00
200	200.000128	199.9998	0.0004	0.30	2.00

4. Effect of Tare test:

Tare Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000041	19.9999	0.0001
	40.000076	39.9998	0.0002
	60.000066	59.9997	0.0003
	80.000107	79.9999	0.0002
	100.000168	100.0004	-0.0003

Remark:

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

เอกสารไม่ควบคุม

o--o-End-o--o

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 2 of 3

Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 23, 2025
Condition As-Received: In Condition

Manufacturer: Mettler Toledo
Readability: 0.0001 g
ID No.: UAE.WAS.002/2552

Condition of Equipment:

Condition of This Result of Calibration:

1. Calibration Method: This instrument was calibrated by method UAE-CP-CAL-006 In-House Method based on UKAS Lab 14 : 2022

2. Reference Standards:

Reference Standard:	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (OIML)	1 mg to 1 kg	8749109122	AMARC	25-009359	Mettler-Toledo	21-Jan-27
Standard Weight Class F1 (OIML)	1 mg to 200 g	11119512	AMARC	24-013840	Mettler-Toledo	04-Feb-26
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Thermo-Hydro-Baro Meter	MHB-38250	AK-94457	SUCCESS	SG-H-00997/67	Success Gateway	21-Nov-25
Thermo-Hydro-Baro Meter	MHB-38250	AK-94457	TPA	25P795	TPA	25-Feb-26

3. This certification is traceable to SI Unit

4. This certification 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. Through the reference standard laboratory of AMARC 25-009359 Calibration 0132

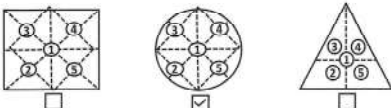
Calibration Result:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200*	0.000045

2. Eccentric or off-center loading

A mass of 100 g was placed and moved to various position on pan
The Balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	Maximum Difference (g)
100.0000	99.9996	99.9997	100.0003	100.0005	0.0005

เอกสารไม่ควบคุม

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	CADMIUM CHROMIUM TRIVALENT COPPER IRON LEAD MANGANESE NICKEL ZINC	Agilent Technologies	AA240S / M1116001	Agilent Technologies (Thailand) Co., Ltd.	Preventive Maintenance Checklist	26/7/2026	23/7/2027
2	Atomic Absorption Spectrometer	ARSENIC SELENIUM FAT OIL AND GREASE	Perkin Elmer	PinAAcle 900F / PFE20031902	Perkin Elmer Co., Ltd.	Preventive Maintenance Report	27/10/2025	26/10/2026
3	Analytical Balance	TOTAL DISSOLVED SOLIDS TOTAL SOLIDS	Mettler Toledo	AB204-S/FACT / 1129361010	United Analyst and Engineering Consultant Co., Ltd.	250422-1-BL002-25	23/4/2025	22/4/2026
4	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XS2050U / 121068594	National Food Institute, Ministry of Industry, Thailand	250226-001-01	20/9/2025	19/9/2026
5	Analytical Balance	CRANIALS HCN	Mettler Toledo	XS2050U / 1009071872	National Food Institute, Ministry of Industry, Thailand	250226-001-01	20/9/2025	19/9/2026
6	Continuous Flow Analyzer (CFA)	SILICA ANALYTICAL B.V., the Netherlands	Sika Analytical B.V., the Netherlands	Sika++500-02 / 182688	DSPH (Thailand) Ltd	WCA-0017079	23/5/2025	22/5/2026
7	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118101863	Technology Promotion Association (Thailand-Boigon)	26TW50	2/9/2026	1/9/2027

Calibration Certificate

Certificate No.: 2502226-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangcheck, Prakhnong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2502226
Operation No.: 7507776-007
Date of Receipt: 19 March 2025
Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
Scientist
Approved by 
(Mr.Phaphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 25 March 2025

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.

FCS-009-Revision:01 Date: 20.04.65

ศูนย์บริการและสนับสนุนการพัฒนาอาหาร
30309 Soi 36, Anan Asoke Road, Bang Yai Khwa Subdistrict, Bang Phat District, Bangkok 10700, Thailand
Tel : (662) 0433 0000 / Fax : (662) 0433 0545

เอกสารไม่ควบคุม



PFI0001

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025

Page 2 of 4

Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C Relative Humidity: 48 ± 3.5 %
Place of Calibration: 208 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-MA-001 3n-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	1mg to 200g	8505567572	TCS	M24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI BTH 017/23	Quality Reborn	QR25-0542	18 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000042
80	0.0000042
100	0.0000000
200	0.0000000

2. Off-Center Error:

A mass of 100 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)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0001	0.0000

FCS-012-Revision:01 Date: 20.04.65

ศูนย์บริการและสนับสนุนการพัฒนาอาหาร
30309 Soi 36, Anan Asoke Road, Bang Yai Khwa Subdistrict, Bang Phat District, Bangkok 10700, Thailand
Tel : (662) 0433 0000 / Fax : (662) 0433 0545

เอกสารไม่ควบคุม



PFI0001

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
8	Gas Chromatography	α-BHC ALDRIN β-BHC γ-BHC DIELDRIN ENDOSULFAN I ENDOSULFAN II ENDOSULFAN SULFATE ENDRIN ENDRIN ALDEHYDE α-BHC HEPTACHLOR HEPTACHLOR EPOXIDE METHOXYCHLOR pp-DDD pp-DDT pp-DDT	Agilent Technologies	8890 / US22294204	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	16/6/2025	15/6/2026
9	Mercury Analyzer	TOTAL MERCURY pp-DDT	NIC, Japan	RA-4500 / J7780278	Coax Group Corporation Ltd.	Preventive Maintenance Report	2/7/2025	1/7/2026
10	Hot Air Oven	TOTAL RESOLVED SOLIDS TOTAL SOLIDS TOTAL SUSPENDED SOLIDS TOTAL COLIFORM BACTERIA	Memmert	UP55 / B212.0411	Technology Promotion Association (Thailand-Japan)	25TH4579	19/3/2025	18/3/2026
11	Cooled Incubator	TOTAL COLIFORM BACTERIA	Bioher	K8400 / VIT8200000015555	National Food Institute, Ministry of Industry, Thailand	2502226-006-01	19/3/2025	18/3/2026
12	Incubator	FECAL COLIFORM BACTERIA	Memmert	IP260 / V615.0187	National Food Institute, Ministry of Industry, Thailand	2502226-001-01	19/3/2025	18/3/2026
13	Inductively Coupled Plasma- Optical Emission Spectrometer(ICP-OES)	BARIUM TITANIUM	Agilent Technologies, USA	5110 VDV(OB015AA) / APTB03001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	3/11/2025	2/11/2026

* Due Date of Calibration*: Based on the annual calibration plan, At least 1 time per year.

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
14	pH Meter	pH	Hanna	UAJ04PH210 / H9900047	technology promotion association (Thailand-Japan)	26CH231	26/2/2026	26/2/2027
15	UV-VIS Spectrophotometer	CHROMIUM HEXAMALENT	Agilent	Cary 60 686804 / MNT541009	DOE Services Co.,Ltd	5925-019	26/5/2025	25/5/2026
16	UV-VIS Spectrophotometer	HYDROGEN SULPHIDE NITRATE NITROGEN PHOSPHATE SULPHATE	Hitech	U-2900 / ZIE22-09	DOE Services Co.,Ltd	5925-021	26/5/2025	25/5/2026
17	UV-VIS Spectrophotometer	CHEMICAL OXYGEN DEMAND FORMALDEHYDE PHENOLS	Hitech high-tech Science Corporation Tokyo Japan	U-5100 / 2344-008	DOE Services Co.,Ltd	5925-024	17/6/2025	16/6/2026
18	Turbidity Meter (portable)	TURBIDITY (NTU)	Gallen Instrument(China)	T1108R / 1120901017	Technology Promotion Association (Thailand-Japan)	25CH1053	9/9/2025	7/9/2026
19	Water Bath	FECAL COLIFORM BACTERIA	Memmert	WH1 16 / L416.0612	Technology Promotion Association (Thailand-Japan)	26TH194	22/2/2026	1/2/2027

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685704
ID No.: UAF-WAO.010/2565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unloaded	0.000000	0.000000	0.000000	0.0000007	2.00
0.001	0.001003	0.001000	-0.000003	0.0000090	2.00
0.005	0.005002	0.005001	-0.000001	0.0000092	2.00
0.01	0.010003	0.010002	-0.000002	0.0000089	2.00
0.05	0.049996	0.050001	0.000005	0.0000096	2.00
0.1	0.100011	0.100002	-0.000009	0.000011	2.00
0.5	0.500016	0.500004	-0.000012	0.000014	2.00
1	1.000003	1.000005	0.000002	0.000016	2.00
2	2.000023	2.000006	-0.000017	0.000017	2.00
5	5.000015	5.000006	-0.000009	0.000020	2.00
10	10.000009	10.000005	-0.000004	0.000026	2.00
20	20.000038	20.000007	-0.000031	0.000037	2.00
30	30.000039	30.000009	-0.000030	0.000050	2.00
50	50.000028	50.000008	-0.000020	0.000068	2.00
80	80.000067	80.000013	-0.000054	0.00011	2.00

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance

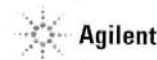
Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies. Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Revision: A.02, Issued: 21 January 2022
Document Number: G8014-90075
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FCS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAF-WAO.010/2565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00010	90.00002	-0.00008	0.00015	2.00
100	100.00006	100.00001	-0.00005	0.00016	2.00
110	110.00007	110.00002	-0.00005	0.00017	2.00
120	120.00009	120.00002	-0.00007	0.00018	2.00
130	130.00010	130.00002	-0.00008	0.00019	2.00
140	140.00013	140.00002	-0.00011	0.00019	2.00
150	150.00009	150.00002	-0.00007	0.00021	2.00
160	160.00010	160.00002	-0.00008	0.00022	2.00
170	170.00012	170.00002	-0.00010	0.00023	2.00
200	200.00013	200.00002	-0.00011	0.00026	2.00

Agilent 5100, 5110 Preventive Maintenance Checklist



Introduction

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. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- 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.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

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

----- End -----

FCS-012 Revision: 01 Date: 20-04-65

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Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- Need to place a service call?** Flexible Repair Options | Agilent

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Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	5110 VDV ICP-OES
Instrument System Site and Location	UAE Consultant

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 5015 A	114 14030001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Nebulizer Type	Sess Spray One Neb Conical Other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass Other
Torch	Radial Dual View Other
Torch Type	One Piece Semi Demountable Fully Demountable Other
Injector Diameter	2.4mm 1.8mm 1.4mm 0.8mm Other
Injector Material	Quartz Ceramic Other

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Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Service not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system 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
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Verification section including the customer's and your signature.

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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 and implementation of Service Notes
- ☒ Check for required firmware/software updates and verify with customers if they would like them installed.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. ☒ N/A
- ☒ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

เอกสารไม่ควบคุม

Preventive Maintenance Procedures

Record Pre-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table – Pre-PM.

Clean and inspect ICP-OES 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 SVDV 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.

Agilent Water Recirculator

- ☐ Service not applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir.
- ☒ Remove, clean and reinstall water inlet metal mesh filter if present.
- ☒ Re fill with Agilent Cool Clear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser.

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ICP-OES adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration
- ☒ Perform Instrument Calibration.

Record Post-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ 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

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

- ☒ Record the result in the Instrument Test Results Table

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SPS 3 Auto Sampler

- ☒ Service 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

- ☒ Service 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
- ☐ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

AVS 4, 6, 7 Advanced Valve System

- ☒ Service 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

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Restore Instrument

- ☐ For HF applications, ask the customer to reinstall their sample introduction system. *N/A*
- ☒ 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

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ 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. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.

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Test Results

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	1795.8	2579.2	2230.8	3562.9
Mn 257.610 nm SRBR	9470.5	19614.9	10882.0	17984.4
Al 396.152 nm SBR	5.2	8.0	7.0	7.4
K 766.491 nm SBR	3.0	14.6	3.4	8.7

* 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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Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Agilent Cool Clear Coolant Fluid	5799 0037	Agilent Water Recirculator	1
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	1
Rotor seal for 6-7 port valve for AVS6/7	G8494 60002	CB404A/CB495	1
Rotor seal for 4 port valve for AVS-1	G8493-60002	CB403A	1
Rinse solution to rinse station 7.5mm id x 1m	G8410-80123	SPS 4	1
Barb connector 2.5mm 1.5mm ID	CB410 80124	SPS 4	1
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	1
Additional Parts may be required from engineer's stock:			
X axis drive belt	5410047500	SPG 0	1
Z axis drive belt	5410047400	SPG 3	1
Peristaltic pump tubing, PVC Solvaflex, 3 bridged	3710049000	SPS 4	1

Consumed Parts Reference

(Purchased by customer, not included as part of PM)

☒ Section Not Applicable

Part Description	Part Number	Product or Model# where used	Quantity consumed
------------------	-------------	------------------------------	-------------------

เอกสารไม่ควบคุม

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	231.298	VAC	226.380	VAC
Mains Current	0.083	A	0.100	A
Instrument Temperature	21.1	°C	21.6	°C
RF Air Flow (sensor speed)	44.0	Hz	41.1	Hz
Plasma Exhaust Temperature	No measurement		47.1	°C
Water Flow Oscillator	No measurement		1.14	L/min
Water Flow Detector	0.92	L/min	0.90	L/min
Water Inlet Temperature	19.5	°C	19.5	°C
Polychromator Temperature	35.4	°C	35.4	°C
CCD Temperature	-40.1	°C	-39.9	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	634.43	kPa	583.77	kPa
Purge Gas Supply Pressure*1	631.28	kPa	604.02	kPa
Option Gas Supply Pressure*1	-	kPa	-	kPa
Nebulizer Flow	No measurement		0.70	L/min
Nebulizer Back Pressure	No measurement		273.61	kPa
Plasma Gas Flow	No measurement		1196	L/min
Auxiliary Gas Flow	No measurement		1.00	L/min
RF Power	No measurement		1200.4	W
RF Supply Current	No measurement		8.228	A
RF Supply Voltage	No measurement		194.529	V

*1 If option installed

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Signature Page

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.

Service Verification

Service Request Number:
600804410Service Engineer Name:
Woravit T.Service Engineer Signature:
Woravit T.Total number of pages in this document:
14Date Service Completed:
3 Nov 2025Customer Name:
Aphorn O.Customer Signature:
Aphorn O.

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification

General Information

Computer Name: Version Number:
Instrument Controller: DESKTOP-SQDHP9U 7.3.2 Build 14225
Client: DESKTOP-SQDHP9U 7.3.2.14225
Operator: Mr.Itsaraphap Bumrungeam
Overall Test Result: **Passed**

Comparison Format:

All Parameters:	Significant Digits:	10
-----------------	---------------------	----



Signature 19/3/26
Reviewer's Signature // Date

Signature 19/3/26
Operator's Signature // Date

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EP/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

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ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Detection Algorithm: Cobra
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Report Variable	Peak Name	Status
Offset (c0)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Slope (c1)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Correlation Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Std. Deviation	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Rel. Std. Dev.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: **Passed**

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra
Calibration Type: Lin. WithOffset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Variable Category	Report Variable	Peak Name	Status
Injection	No.		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
	Noise		ok
Peak Results	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution (EP)	Acetophenone	ok
	Resolution (USP)	Acetanilide	ok
	Resolution (USP)	Acetophenone	ok
	Resolution (USP)	Acetanilide	ok
	Asymmetry (FP)	Acetanilide	ok
	Asymmetry (FP)	Acetophenone	ok
	Asymmetry (FP)	Propiophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Abs.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor. Plates(JP)	Acetanilide	ok
	Theor. Plates(JP)	Acetophenone	ok
	Theor. Plates(JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok
	RF-Value	Acetanilide	ok
	RF-Value	Acetophenone	ok
	RF-Value	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	OK
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max at	Acetanilide	ok
	Rel.Max at	Acetophenone	ok
	Rel.Max at	Propiophenone	ok

Test Result: Passed

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Acetophenone	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
Component	Cal.Type	Acetanilide	ok
	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok

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Chromeleon Operational Qualification, Part 3

System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
System Suitability Test Case	Number	ok
	Name	ok
	Inj. Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
System Suitability Test Case Result	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
	Inj. Eval. Result	ok
	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
	Sum	ok

Test Result: Passed

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PQ

Performance Qualification

Service Details

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System Repeatability OQ Autosampler AS-DV 1 Test 1	PASSED
Carryover OQ Autosampler AS-DV 1 Test 1	PASSED
Flow Rate Repeatability OQ Pump Injection Core 1 Test 1	PASSED
Noise Drill OQ Detector (Injection CD) Conductivity Detector 1 Test 1	PASSED
Detector Linearity OQ Detector (Injection CD) Conductivity Detector 1 Test 1	PASSED
Oven Temperature Accuracy OQ Column Compartment Injection Core 1 Test 1	PASSED
Service Review and Completion	PASSED

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Service Summary

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These IQOQ Results should be reviewed by the Customer. If the IQOQ is accepted, both the Customer and the Service Representative should sign the IQOQ Results, below.

IQOQ Results

Based upon the actual results obtained, this IQOQ **PASSED** the acceptance criteria described in the Installation Qualification and Operational Qualification procedure.

Service Representative

A Field Service Representative signature below confirms the completion of all aspects of the Installation Qualification and Operational Qualification and have concluded that the system has been successfully verified to be operating as required.

Customer

A Customer signature below confirms the completion of all aspects of the Installation Qualification and Operational Qualification have been completed and that the system has been successfully verified to be operating as required.

Test Equipment and Standards

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Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal Ver Date	Good Until
Multimeter	FLUKE	209	59270015	19 Dec 2025	19 Dec 2026
Thermocouple	FLUKE	K Type	59270015	22 Dec 2025	22 Dec 2026

Test Standards and Solvents

Description	Manufacturer	Conc. / Grade	Part Number	Lot Number	Expiration Date
Nitrate	Thermo Scientific	5 ppm	060254	250414	Apr 2026
Nitrate	Thermo Scientific	10 ppm	060254	250414	Apr 2026
Nitrate	Thermo Scientific	25 ppm	060254	250414	Apr 2026
Nitrate	Thermo Scientific	50 ppm	060254	250414	Apr 2026
Nitrate	Thermo Scientific	100 ppm	060254	250414	Apr 2026
Nitrate	Thermo Scientific	1000 ppm	060254	250414	Apr 2026



Thermo Representative	
Signature:	Date: 19/3/26
Customer	
Signature:	Date: 19/3/26

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Autosampler Information

Autosampler Model	AS-DV
Serial Number	25027024
Firmware Version	
Instrument Assigned	Instrument 1
Tray Type	10.0 mL Vials
Syringe Volume	N/A
Loop Volume	25 µL
Connection	USB
Powered On Successfully?	Yes

System Information

Model	AS-DV	Acquisition Date	19/3/26
Serial Number	25027024	Sequence	OQ_IC_IVN_AS DV_CD
System Name	Inuvion_Anion		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Peak Results

	Sample Name	Injection Volume (µL)	Retention Time (min)	Area (µS*min)
Blank	Reference Blank	25	0.5033	0.006
High	High Standard	25	0.5017	58.096
Carryover	Carryover	25	0.4983	0.009

Carryover Area Results

Test	Measured	OQ Limit	Result
Carryover Area Result	0.01 %	≤ 0.10 %	PASSED

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เอกสารไม่ควบคุม

System Information

Model	AS-DV	Acquisition Date	19/3/26
Serial Number	25027024	Sequence	OQ_IC_IVN_AS DV_CD
System Name	Inuvion_Anion		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area (µS*min)
Repeatability 01	25	0.5017	3.048
Repeatability 02	25	0.5017	3.066
Repeatability 03	25	0.5017	3.063
Repeatability 04	25	0.5	3.08
Repeatability 05	25	0.5	3.08
Repeatability 06	25	0.5017	3.084

Repeatability Results

Test	Measured	OQ Limit	Result
Retention Time Result	0.2 % RSD	≤ 5.0 % RSD	PASSED
Area Result	0.4 % RSD	≤ 1.0 % RSD	PASSED

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Pump Information

Pump Model	Inuvion Core
Serial Number	250451070
Firmware Version	
Pump Position	Single Unit
Seal Type	N/A
Pressure Units	psi
Connection	USB
Powered On Successfully?	Yes

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Flow Rate Repeatability OQ Pump Inuvion Core 1 Test 1

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System Information

Model	Inuvion Core	Acquisition Date	19/3/26
Serial Number	250451070	Sequence	OQ_IC_IVN_ASDV_CD
System Name	Inuvion_Anion	Pump Position	Single Unit
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Peak Results

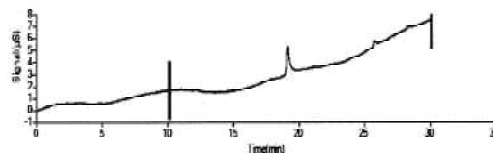
Sample Name	Injection Volume (uL)	Retention Time (min)
Repeatability 01	25	0.5017
Repeatability 02	25	0.5017
Repeatability 03	25	0.5017
Repeatability 04	25	0.5
Repeatability 05	25	0.5
Repeatability 06	25	0.5017

Repeatability Results

Test	Measured	OQ Limit	Result
Retention Time Result	0.2 % RSD	≤ 5.0 % RSD	PASSED

Noise Drift OQ Detector (Inuvion CD) Conductivity Detector 1 Test 1

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System Information

Model	Inuvion CD	Acquisition Date	19/3/26
Serial Number	250452051	Sequence	OQ_IC_IVN_ASDV_CD
System Name	Inuvion_Anion		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Noise Drift Results

Test	Measured	OQ Limit	Result	Conversion Factor
Noise Result	0.3 nS	≤ 2.0 nS	PASSED	1000
Drift Result	18.7 nS/hr	≤ 20.0 nS/hr	PASSED	1000

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Detector (Inuvion CD) Conductivity Detector 1

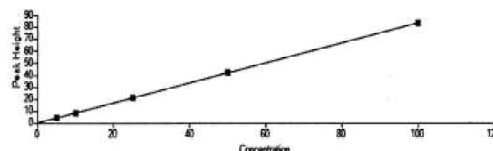
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Detector Information

Detector Model	Inuvion CD
Serial Number	250452051
Powered On Successfully?	Yes

Detector Linearity OQ Detector (Inuvion CD) Conductivity Detector 1 Test 1

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System Information

Model	Inuvion CD	Acquisition Date	19/3/26
Serial Number	250452051	Sequence	OQ_IC_IVN_ASDV_CD
System Name	Inuvion_Anion		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Peak Results

Sample Name	Concentration (ppm)	Peak Height (uS)	Calculated
IC Detector Linearity 01	5	4.522	4.782503
IC Detector Linearity 02	10	8.769	9.884257
IC Detector Linearity 03	25	21.525	25.207537
IC Detector Linearity 04	50	42.422	50.310279
IC Detector Linearity 05	100	83.633	99.815428

Linearity Results

Test	Measured	OQ Limit	Result
R ²	1.000	≥ 0.999	PASSED

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Line Number	Work Description		
WL-00342192	- ทำ PM เสร็จแล้ว, เครื่องพร้อมใช้งาน		
PARTS CONSUMED			
Part No	Part Description		Quantity
EXPENSES			
Part No	Expense Type	Description	Line Quantity
RECOMMENDED PARTS			
อะไหล่สำรองที่ควรสั่งซื้อทั้งหมด 7 รายการ คือ Pump tube 3 รายการ (SA3032, SA3032 และ SA3034), หลอดไฟ Halogen 6V/10W (90020012) 1 รายการ จำนวน 2 หลอด, Tubing polyethylene 3 รายการ (SA3142, SA5141 และ SA5142)			
REMARKS			

Travel Time Disclaimer:
Please note that the travel time in this report only includes time taken to reach the installed equipment location. It does not include our engineer's return travel time.

Customer Signature: _____

Technician: Yongyuth Chanphong
Job Title: Service Manager
Email: yongyuth-yc@dksh.com

Customer Signature _____

Date: 06/06/2025



Check with Standard

Item	Characteristic	Before	After	Remark
14	Base Line Test	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
15	Detector Signal Test	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

Summary of checked

- ☐ The instrument can work normally and efficiently. (เครื่องมือสามารถทำงานได้ปกติและมีประสิทธิภาพ)
- ☐ The instrument can work but it's requiring to maintenance. (เครื่องมือสามารถทำงานได้แต่ต้องบำรุงรักษา)
- ☐ The instrument could not work it's requiring to repair. (เครื่องมือทำงานไม่ได้ต้องทำการซ่อมแซม)

Remark :

* Pump tube, Tubing polyethylene และ Air tube เป็นอะไหล่ที่เปลี่ยนเป็นประจำตามระยะเวลาการใช้งาน

หมายเหตุ และอะไหล่ที่ควรสั่งซื้อทั้งหมด 7 รายการ คือ

1. อะไหล่ พารามิเตอร์ Ammonia จำนวน 3 รายการ (SA3032, SA5141 และ 90020012)

2. อะไหล่ พารามิเตอร์ Phenol และ Cyanide จำนวน 6 รายการ (SA3028, SA3034, SA3142, SA5142 และ 90020012)

Standard Equipment Used

Equipment	Equipment I.D.
Digital multi meter	S/N 57600592 Due date : 19-Jun-2025
Thermo hygrometer	S/N 39520444/904 Due date : 27-Dec-2025

Test By : _____ Approved by : _____

(Mr. Yongyuth Chanphong) (Mr. Eknapong Wankiang)

Position : _____ Supervisor, Technical Service Position : _____ Manager, Technical Services



Job No. WO-00074079

Test Report			
Customers	United Analyst and Engineering Consultant Co., Ltd.		
Equipment	Continuous Flow Analyzer	Manufacturer	SKALAR
Controller Mdel	SA5000	Auto Sample Model	SA1052
Controller Serial No.	182688	Auto Sample Serial No.	181729
Date of test	23-May-2025	Period	12 Month
Environment temperature	24.3 °C	Humidity	54.4 %RH

Results

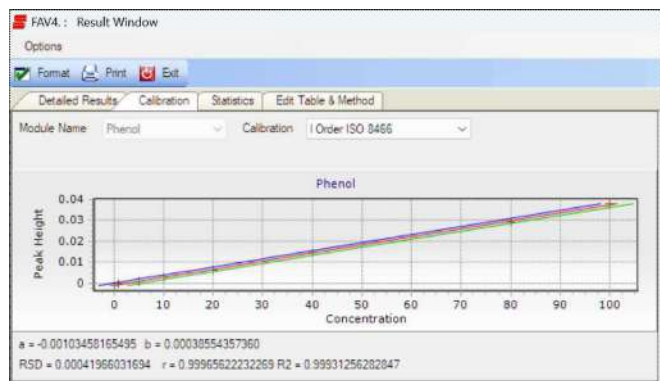
Item	Characteristic	Before	After	Remark
1	Visual inspect	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
2	Power supply (210 - 240 VAC)	220 VAC	220 VAC	
3	Computer	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
4	Program	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
5	Auto sampler	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
6	Module holder	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
	- Motor pump	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
	- Pump tube	☐ Pass ☐ Fail	☐ Pass ☐ Fail	*
	- Air-injection	☐ Pass ☐ Fail	☐ Pass ☐ Fail	*
	- Chemistry manifolds, Switching valve, Coil, Membrane	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
7	Detector	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
	- Filter	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
	- Flow cell	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
	- Lamp	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
8	Interface	☐ Pass ☐ Fail	☐ Pass ☐ Fail	
9	Rinsing valves	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
10	Temperature / Reactor	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
11	Flame photometer	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	
12	UPS / Stabilizer	☐ Pass ☐ Fail ☐ N/A	☐ Pass ☐ Fail ☐ N/A	

Item	Event	Before	After
13	Error list	☐ None ☐ Appear : _____	☐ None ☐ Appear : _____



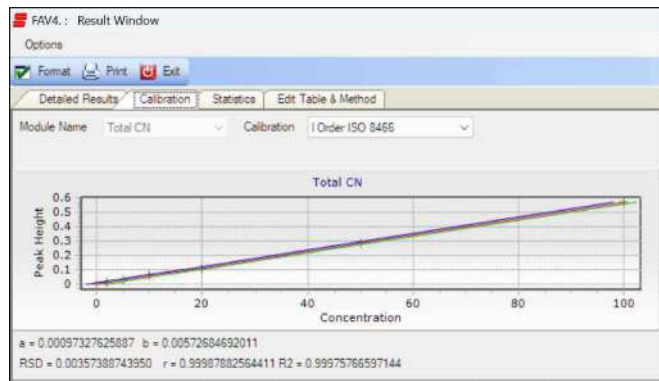
Base Line Test : Reagent_Baseline_CN_Phenol_NH3





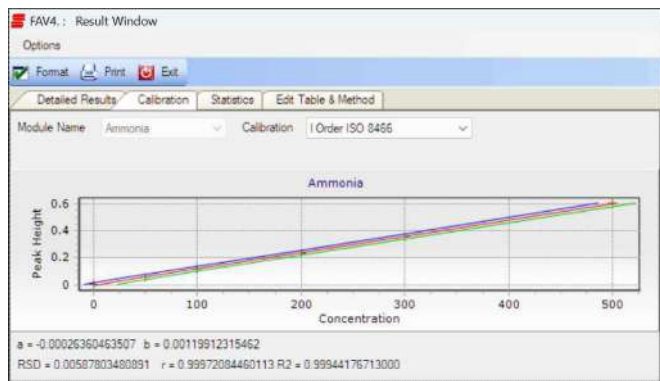
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UAE TOX 009/2566

Agilent
CrossLab
From insight to outcome

Agilent CrossLab Start Up Services
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 preventive maintenance activities.



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Introduction

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, 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>
- The Agilent Community is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilent/resources>.
- Need technical support, FAQs, supplies? – visit our Support Home page <http://www.agilent.com/search/support>.
- Videos about specific preparation requirements for your instrument can be found by searching the Agilent YouTube channel at <https://www.youtube.com/user/agilent>.

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DE number: 44166.759722222
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Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

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System Information

- ☒ Check this box if an instrument configuration report is attached instead of completing the table below

Instrument System Name and ID	UAE.TOX 009/2566 / US2229A024
Instrument System Site and Location	UAE / Room 404

List System Component Product Numbers	List the Serial Numbers of each Component
1. B3540A	US2229A024
2. G4579A	CN22285350
3. G4554A	CN22287018
4.	
5.	
6.	
7.	
8.	
9.	
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.

Revision: 2.01, Issued: September 14, 2021
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เอกสารไม่ควบคุม

Preventive Maintenance 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

- ☒ Replace the split vent trap cartridge filter using the maintenance procedure from either the Browser User interfaces on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ 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.
- ☒ For the inlets installed, perform inlet maintenance using the Maintenance procedure from the Browser User interfaces. Record the results. (Leak and Restriction test)
- ☒ 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 Browser interface.
- ☒ Perform inlet pressure decay test(s) from the diagnostics screen on the Browser User interface. Record if test passed or failed in the results table.

Note: If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM

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ALS Maintenance

Section NOT applicable

- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove 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 Browser 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.

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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	N/A
SSL Capillary Inlet PM Kit, Split	5188-6496	8890 GC	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	8890 GC	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	8890 GC	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	8890 GC	N/A
PP Inlet PM Kit	5188-6498	8890 GC	N/A
Split vent trap PM kit, angle cartridge (for MMI, PTV & VI)	5100-6495	8890 GC	N/A
MMI Cleaning Kit	61510-60620	8890 GC	N/A
PTV Septumless Head Rebuild Kit	5182-9747	8890 GC	N/A
PTV Septumless Head Injection Guide Ignitor (glow plug) assembly with O-ring	5182-9748	8890 GC	N/A
	19231-60680	8890 GC	1
FID Collector Rebuild/Cleaning Kit	61531-67000	8890 GC	N/A
FID Collector Replacement Kit	61531-67001	8890 GC	N/A
Standard .011-inch FID Jet	5200-0176	8890 GC	1
Universal .018-inch FID Jet	5200-0177	8890 GC	N/A

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Signature Page

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 with the customer this service, parts replaced, and test results obtained.
- ☒ 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.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

PM Test Results Table

Test description	Before PM Service	After PM Service
Front detector output	N/A	249.1 Hz
Back detector output	N/A	14.9 Hz
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	Pass
Leak and Restriction Test after back inlet maintenance	Pass	Pass
Leak and Restriction Test after front inlet Split Vent Trap replacement	Pass	Pass
Leak and Restriction Test after back inlet Split Vent Trap replacement	Pass	Pass
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass

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Service Engineer Comments

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 609559060 Date service completed 16 June 2025
 Agilent signature [Signature] Customer signature [Signature]
 Total number of pages in this document 9 pages

Revision: 2.01, Issued: September 14, 2021
 Agile Document Number: D0013610
 DE number: 44166.759722222
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เอกสารไม่ควบคุม

Certificate No.: 260311-2-BL002-26
Code No.: BL002-26
Page: 2 of 4

Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026
Condition As-Received: in Condition

Manufacturer: Mettler Toledo
Readability: 0 to 81 (g): 0.01 mg > 80 to 200 (g): 0.1 mg
ID No.: UAE.WAO.012/2563

Condition of Equipment:
Condition of This Result of Calibration:
1. Calibration Method: (This instrument was calibrated by method UAE-CAL-009
2. Reference Standard:
Reference Standard: Model Serial No. Calibrated By Certificate No. Traceability Due Date
Standard Weight Class E2 (OIML) 1 mg to 1 kg CS10641605 METTLER TOLEDO GmbH C510641605 Mettler-Toledo GmbH 3-Mar-27
Standard Weight Class E2 (OIML) 1 mg to 1 kg 8749109122 AMARC 25-009359 Mettler-Toledo 21-Jan-27

Instrument Model Serial No. Calibrated By Certificate No. Traceability Due Date
Thermo-Hygro-Saro Meter MHB 38250 AK46457 SUCCESS SG-H 00992/68 25F4644 Success Gateway 26-Nov-26
Thermo-Hygro-Saro Meter MHB 38250 AK46457 TPA 18-Dec-26

3. This certification is traceable to SI Unit
4. This certification was certified only for the instrument as calibrated
5. This result of calibration was found accurate as shown on date and place of calibration only
6. Through the reference standard laboratory of Mettler-Toledo GmbH C510641605, SAS accreditation number MCS 0032
7. Through the reference standard laboratory of AMARC 25-009359, TSI accreditation number 0152

Calibration Result:
1. Repeatability of Reading:
Nominal Value (g) Standard Deviation of Reading (g)
80 0.000008
200* 0.000045

2. Eccentric or off-center loading
A mass of 100 g was placed and moved to various position on pan
The balance reading obtained is given in the table.

Use the balance reading diagrams given in the table.

1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	Maximum Difference (g)
100.0000	100.0000	100.0000	100.0000	100.0000	0.0000

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เอกสารไม่ควบคุม

Certificate No.: 260311-2-BL002-26
Code No.: BL002-26
Page: 3 of 4

Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026

Manufacturer: Mettler Toledo
Readability: 0 to 81 (g): 0.01 mg > 80 to 200 (g): 0.1 mg
ID No.: UAE.WAO.012/2563

Calibration Result: (Continued)
Calibration Range: 0 to 80 (g)
Calibration Adjustment: Internal Calibration

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.0000	0.0000	0.015	2.25
0.001	0.0010020	0.0010	0.0000	0.015	2.25
0.005	0.0050025	0.0050	-0.0002	0.015	2.25
0.01	0.0100005	0.0100	-0.00002	0.015	2.25
0.05	0.0500003	0.0500	-0.00001	0.015	2.21
0.10	0.1000083	0.1000	-0.00001	0.015	2.20
0.50	0.5000121	0.5000	-0.00002	0.016	2.15
1	1.0000119	1.0000	0.00000	0.016	2.12
2	2.0000125	2.0000	0.00001	0.017	2.09
5	5.0000146	5.0000	-0.00002	0.020	2.05
10	10.0000330	10.0001	-0.00002	0.023	2.00
20	20.000028	20.0001	-0.00005	0.033	2.00
30	30.000061	30.0001	0.00004	0.061	2.00
40	40.000054	40.0001	-0.00004	0.063	2.00
50	50.000037	50.0001	-0.00005	0.064	2.00
60	60.000070	60.0001	-0.00004	0.081	2.00
80	80.000098	80.0001	-0.00001	0.11	2.00

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เอกสารไม่ควบคุม

Certificate No.: 260311-2-BL002-26
Code No.: BL002-26
Page: 4 of 4

Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026

Manufacturer: Mettler Toledo
Readability: 0 to 81 (g): 0.01 mg > 80 to 200 (g): 0.1 mg
ID No.: UAE.WAO.012/2563

Calibration Result: (Continued)
Calibration Range: > 80 to 200 (g)
Calibration Adjustment: Internal Calibration

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.0000	0.0000	0.02	2.25
90	90.0000010	90.0000	0.0000	0.16	2.00
100	100.0000420	100.0000	0.0000	0.16	2.00
110	110.0000730	110.0000	0.0000	0.17	2.00
120	120.0000680	120.0000	0.0001	0.18	2.00
130	130.0001016	130.0000	0.0000	0.20	2.00
140	140.0000960	140.0000	0.0001	0.21	2.00
150	150.0000790	150.0003	0.0003	0.21	2.00
160	160.0001191	160.0003	0.0001	0.23	2.00
170	170.0001050	170.0003	-0.0002	0.24	2.00
200	200.0001460	200.0004	-0.0002	0.26	2.00

Test Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000028	20.0000	0.0000
	40.000034	40.0002	-0.0001
	60.000070	60.0002	-0.0001
	80.000098	80.0002	-0.0001
	100.000042	100.0003	-0.0002

Remark:

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

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เอกสารไม่ควบคุม

Certificate No.: 260311-2-BL002-26
Code No.: BL002-26
Page: 3 of 4

Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026

Manufacturer: Mettler Toledo
Readability: 0 to 81 (g): 0.01 mg > 80 to 200 (g): 0.1 mg
ID No.: UAE.WAO.012/2563

Calibration Result: (Continued)
Calibration Range: 0 to 80 (g)
Calibration Adjustment: Internal Calibration

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.0000	0.0000	0.015	2.25
0.001	0.0010020	0.0010	0.0000	0.015	2.25
0.005	0.0050025	0.0050	-0.0002	0.015	2.25
0.01	0.0100005	0.0100	-0.00002	0.015	2.25
0.05	0.0500003	0.0500	-0.00001	0.015	2.21
0.10	0.1000083	0.1000	-0.00001	0.015	2.20
0.50	0.5000121	0.5000	-0.00002	0.016	2.15
1	1.0000119	1.0000	0.00000	0.016	2.12
2	2.0000125	2.0000	0.00001	0.017	2.09
5	5.0000146	5.0000	-0.00002	0.020	2.05
10	10.0000330	10.0001	-0.00002	0.023	2.00
20	20.000028	20.0001	-0.00005	0.033	2.00
30	30.000061	30.0001	0.00004	0.061	2.00
40	40.000054	40.0001	-0.00004	0.063	2.00
50	50.000037	50.0001	-0.00005	0.064	2.00
60	60.000070	60.0001	-0.00004	0.081	2.00
80	80.000098	80.0001	-0.00001	0.11	2.00

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เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2602300-001-01
Page: 1 of 2

Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMBERT
Model: UF35
Serial No.: B212.0411
ID No.: UAE.WAO.005/2558
Order No.: 2602300
Operation No.: 2602300-001
Date of Receipt: 11 March 2026
Date of Calibration: 11 March 2026

Customer Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong, Bangkok 10260

Metrological traceability:

- Calibration Method:
- This instrument was calibrated by inserting 9 standard thermometers into its chamber, in accordance with W-TE-014.
- based on TLAS G 20-162-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used in this laboratory is the International Temperature Scale of 1990 (ITS-90).
- All data shown below are final values, and the initial data may be obtained upon request.

2. Reference Standard Instrument:

Instrument	Model/Type	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	349/2A RTD	MY90002902 CHN201-20W RTD201-20W	2602787-003-01	3 May 2026	NATIONAL FOOD INSTITUTE

- This certificate is traceable to the International System of Units (SI).
- This certificate is valid only for the instrument that was calibrated.
- The result of this calibration was found to be accurate only on the date and at the place of calibration shown.

Calibrated by: Mr. Manas Somsak
Specialist
Date of Issue: 18 March 2026

Approved by: (Mr. Phersaphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

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.

P-C5-009 Revision: 02 Date: 01-10-68

เอกสารไม่ควบคุม



Calibration Certificate

Certificate No.: 2602300-001-01
Page : 2 of 2

Calibration Condition:

Equipment: CHAMBER (Hot Air Oven) Place of Calibration: Laboratory
UUC Resolution: 0.1 °C UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Condition of the item: Normal & Good Environment Conditions: Ambient Temperature: (29.8 ± 1.0) °C
Without adjustment / As Found Relative Humidity: (47.8 ± 4) %
Time of record 1 hour 0 minute / point Line Voltage: (222 ± 3) V.

Calibration Results:

Table 1 : Reporting of Temperature

Calibration Point (°C)	Std.#1	Std.#2	Std.#3	Std.#4	Std.#5	Std.#6	Std.#7	Std.#8	Std.#9	Measurement Uncertainty (1°C)
104.0	104.22	103.87	103.90	104.17	103.56	103.58	104.22	104.17	104.00	0.53
120.0	120.21	119.78	119.86	120.18	119.53	119.56	120.24	120.20	119.96	0.73
180.0	180.27	179.37	179.73	180.21	178.91	179.13	180.35	180.25	179.84	0.90

Table 2 : Reporting of Characterization Results

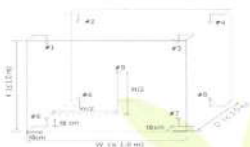
UUC Setting (°C)	Max	UUC Reading (°C)	Average	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
104.0	104.0	104.0	104.0	0.95	0.44	0.75
120.0	120.0	120.0	120.0	0.96	0.43	0.79
180.0	180.0	180.0	180.0	0.97	0.93	1.56

Note

- UUC : Unit Under Calibration
- The quoted uncertainty includes contributions from Stability and Loading Effect (20% of Temperature Uniformity).
- Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
- 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.
- Overall Variation = The difference of The maximum and minimum measured temperatures throughout observation time.

For more information, details of the sensor installation should be reported.

Fresh air damper	Open	Position
	X Close	100% Fan speed
		Not Available
Dimension of inside chamber and sensor installation location (cm)		
W x H x D	40	x 40 x 33
B x D x C	10	x 10 x 10



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 of Report -----

F-CS-009 Revision: 02 Date: 01-10-08

2009 ฐานการพัฒนาระบบนิเวศอุตสาหกรรม ศูนย์บริการห้องปฏิบัติการฐานการพัฒนาระบบนิเวศอุตสาหกรรม
2009 So. 36, Arun Amarin Road, Bang Yai Khan Sub-district, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8588 Fax : +66(0) 2422 8545

Calibration Certificate

Certificate No.: 2602303-001-01
Page : 1 of 2

Equipment: CHAMBER (Incubator)
Manufacturer: MEMMERT
Model: IFF260
Serial No.: V615.0187
ID No.: UAE.MIC.0032559
Order No.: 2602303
Operation No.: 2602303-001
Date of Receipt: 11 March 2026
Date of Calibration: 11 March 2026

Customer Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 So Udomsak 41, Sukhumvit Road,
Bangkok, Prathomong, Bangkok 10260

Metrological traceability:

1. Calibration Method:
 - This instrument was calibrated by inserting 9 standard thermometers into its chamber, in accordance with W-TE-014, based on ILAS G-20-102-08 (E) Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
 - The temperature scale used in this laboratory is the International Temperature Scale of 1990 (ITS-90).
 - All data shown below are final values, and the initial data may be obtained upon request.

2. Reference Standard Instrument:

Instrument	Model/Type	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	DAG073A RTD	MY59008664 CHP101-109/RTD101-109	2602244-001-01	29 March 2026	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to the International System of Units (SI).
4. This certificate is valid only for the instrument that was calibrated.
5. The result of this calibration was found to be accurate only on the date and at the place of calibration shown.

Calibrated by Mr.Nuttapol Niyomchat Specialist
Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 19 March 2026

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: 02 Date: 01-10-08

2009 ฐานการพัฒนาระบบนิเวศอุตสาหกรรม ศูนย์บริการห้องปฏิบัติการฐานการพัฒนาระบบนิเวศอุตสาหกรรม
2009 So. 36, Arun Amarin Road, Bang Yai Khan Sub-district, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8588 Fax : +66(0) 2422 8545

Calibration Certificate

Certificate No.: 2602303-001-01
Page : 2 of 2

Calibration Condition:

Equipment: CHAMBER (Incubator) Place of Calibration: Microbiology Laboratory
UUC Resolution: 0.1 °C UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Condition of the item: Normal & Good Environment Conditions: Ambient Temperature: (17.2 ± 1) °C
Without adjustment / As Found Relative Humidity: (51.5 ± 4) %
Time of record 1 hour 0 minute / point Line Voltage: (226 ± 3) V.

Calibration Results:

Table 1 : Reporting of Temperature

Calibration Point (°C)	Std.#1	Std.#2	Std.#3	Std.#4	Std.#5	Std.#6	Std.#7	Std.#8	Std.#9	Measurement Uncertainty (1°C)
35.0	35.01	34.94	35.00	35.16	35.06	34.98	34.90	34.83	35.02	0.26

Table 2 : Reporting of Characterization Results

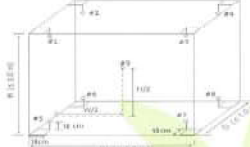
UUC Setting (°C)	Max	UUC Reading (°C)	Average	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	35.0	0.089	0.24	0.53

Note

- UUC : Unit Under Calibration
- The quoted uncertainty includes contributions from Stability and Loading Effect (20% of Temperature Uniformity).
- Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
- Uniformity = The maximum difference of measured temperatures of any sensors and the measured temperature at the reference location which are observed at the same time.
- Overall Variation = The difference of The maximum and minimum measured temperatures throughout observation time.

For more information, details of the sensor installation should be reported.

Fresh air damper	Open	Position
	X Close	100% Fan speed
		Not Available
Dimension of inside chamber and sensor installation location (cm)		
W x H x D	64	x 80 x 90
B x D x C	10	x 10 x 10



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 of Report -----

F-CS-009 Revision: 02 Date: 01-10-08

2009 ฐานการพัฒนาระบบนิเวศอุตสาหกรรม ศูนย์บริการห้องปฏิบัติการฐานการพัฒนาระบบนิเวศอุตสาหกรรม
2009 So. 36, Arun Amarin Road, Bang Yai Khan Sub-district, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8588 Fax : +66(0) 2422 8545

Calibration Certificate

Certificate No.: 2602303-006-01
Page : 1 of 2

Equipment: CHAMBER (Incubator)
Manufacturer: BINDER
Model: KB 400
Serial No.: 20200500010535
ID No.: UAE.MIC.0182564
Order No.: 2602303
Operation No.: 2602303-006
Date of Receipt: 11 March 2026
Date of Calibration: 11 March 2026

Customer Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 So Udomsak 41, Sukhumvit Road,
Bangkok, Prathomong, Bangkok 10260

Metrological traceability:

1. Calibration Method:
 - This instrument was calibrated by inserting 9 standard thermometers into its chamber, in accordance with W-TE-014, based on ILAS G-20-102-08 (E) Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
 - The temperature scale used in this laboratory is the International Temperature Scale of 1990 (ITS-90).
 - All data shown below are final values, and the initial data may be obtained upon request.

2. Reference Standard Instrument:

Instrument	Model/Type	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	DAG073A RTD	MY59008664 CHP101-109/RTD101-109	2602244-001-01	29 March 2026	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to the International System of Units (SI).
4. This certificate is valid only for the instrument that was calibrated.
5. The result of this calibration was found to be accurate only on the date and at the place of calibration shown.

Calibrated by Mr.Nuttapol Niyomchat Specialist
Approved by (Mr.Pheraphat Tuanjit) Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 19 March 2026

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: 02 Date: 01-10-08

2009 ฐานการพัฒนาระบบนิเวศอุตสาหกรรม ศูนย์บริการห้องปฏิบัติการฐานการพัฒนาระบบนิเวศอุตสาหกรรม
2009 So. 36, Arun Amarin Road, Bang Yai Khan Sub-district, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8588 Fax : +66(0) 2422 8545

Calibration Certificate

Certificate No.: 2602303-006-01
Page: 2 of 2

Calibration Condition:

Equipment: CHAMBER (incubator) Place of Calibration: Microbiology Laboratory
UUC Resolution: 0.1 °C UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Condition of the item: Normal & Good Environment Conditions: Ambient Temperature (17.2 ± 1) °C
Without adjustment / As Found Relative Humidity (51.5 ± 4) %
Time of record 1 hour 9 minute / point Line Voltage (229 ± 2) V.

Calibration Results:

Table 1 : Reporting of Temperature

Calibration Point (°C)	Std.#1	Std.#2	Std.#3	Std.#4	Std.#5	Std.#6	Std.#7	Std.#8	Std.#9	Measurement Uncertainty (°C)
35.0	34.78	34.86	34.81	34.83	35.22	35.21	35.22	35.12	34.83	0.28

Table 2 : Reporting of Characterization Results

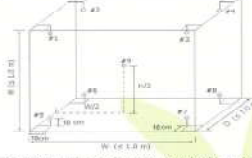
UUC Setting (°C)	Max	UUC Reading (°C)	Average	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	35.0	0.034	0.39	0.52

Note

- UUC: Unit Under Calibration
- The quoted uncertainty includes contributions from 'Stability' and 'Reading Effect' (20% of Temperature Uniformity).
- Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
- 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.
- Overall Variation = The difference of The maximum and minimum measured temperatures throughout observation time.

For more information, details of the sensor installation should be reported.

Switch as Follows:	Open	Close	100% Fan speed
X	Close	100% Fan speed	
Y	Not Available		



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 of Report

P-CIS-009 Revision: 02 Date: 01-10-68

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Certificate of Calibration

Certificate No.: 260311-2-BL001-26
Code No.: BL001-26
Page: 1 of 4

Certificate No.: 260311-2-BL001-26
Code No.: BL001-26
Page: 3 of 4

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Phrakhanong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: XSR205DU

Serial No.: C210685394

Asset No.: UAE.WAO.010/2565

Building: UAE number 3 Floor: 2 Room: 208

Received Date: March 11, 2026

Date of Calibration: March 12, 2026

Calibration Conditions: Temperature 23.0 °C to 23.6 °C
Humidity 51.5 % to 54.4 %
Pressure 757.7 mmHg to 757.9 mmHg

Calibrated by: Thanachat Chatpahol

Approved by: Suwit Chotnok

Signature: *Suwit Chotnok*

Issued Date: March 16, 2026

Note: 1) The Uncertainties are for a confidence probability of approximately 95%

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

3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

Equipment: Electronic Balance Manufacturer: Mettler Toledo
Model: XSR205DU Readability: 0 to 81 (g) 0.01 mg, > 80 to 200 (g) : 0.1 mg
Serial No.: C210685394 ID No.: UAE.WAO.010/2565
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026

Calibration Result: (Continued)

Calibration Range: 0 to 80 (g)

Calibration Adjustment: Internal Calibration

3. Error of Indication from nominal or conventional mass value: (Range: 0 to 81 (g) ; Resolution: 0.0001 (g))

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.00000	0.00000	0.032	2.65
0.001	0.0010020	0.00101	0.00000	0.032	2.65
0.005	0.0050025	0.00501	-0.00001	0.032	2.65
0.01	0.0100009	0.01001	-0.00001	0.032	2.65
0.05	0.0500003	0.05001	-0.00001	0.032	2.65
0.10	0.1000083	0.10000	0.00001	0.035	2.65
0.50	0.5000121	0.50001	0.00000	0.033	2.65
1	1.0000119	1.00003	-0.00002	0.032	2.52
2	2.0000125	2.00003	-0.00002	0.033	2.52
5	5.0000146	5.00003	-0.00002	0.033	2.52
10	10.0000330	10.00006	-0.00003	0.034	2.21
20	20.0000228	20.00006	-0.00004	0.041	2.07
30	30.000061	30.00017	-0.00011	0.055	2.00
40	40.000054	40.00021	-0.00016	0.066	2.00
50	50.000037	50.00023	-0.00019	0.068	2.00
60	60.000070	60.00029	-0.00022	0.084	2.00
80	80.000098	80.00039	-0.00030	0.12	2.00

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Certificate No.: 260311-2-BL001-26

Code No.: BL001-26

Page: 4 of 4

Certificate No.: 260318-1-BL007-26

Code No.: BL007-26

Page: 2 of 3

Equipment: Electronic Balance
Model: XS205SCU
Serial No.: C210685394
Max. Capacity: 81 g / 220 g
Calibration Date: March 12, 2026

Manufacturer: Mettler Toledo
Readability: 0 to 81 (g) 0.01 mg, > 80 to 200 (g) : 0.1 mg
ID No.: UAE.WAS.010/2555

Calibration Result: (Continued)
Calibration Range: > 81 to 200 (g)
Calibration Adjustment: Internal Calibration

3. Error of Indication from nominal or conventional mass value: (Range: > 81 - 220 (g) : Resolution: 0.0001 g)

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty ($\pm$ mg)	Coverage Factor k
Unload	0.0000000	0.0000	0.0000	0.032	2.65
90	90.0000910	90.0004	-0.0003	0.16	2.00
100	100.0000420	100.0003	-0.0003	0.16	2.00
110	110.0000750	110.0004	-0.0003	0.10	2.00
120	120.0000680	120.0004	-0.0003	0.19	2.00
130	130.0001010	130.0005	-0.0004	0.20	2.00
140	140.0000960	140.0004	-0.0003	0.21	2.00
150	150.0000790	150.0005	-0.0004	0.22	2.00
160	160.0001120	160.0004	-0.0003	0.23	2.00
170	170.0001050	170.0003	-0.0002	0.24	2.00
200	200.0001460	200.0001	0.0000	0.26	2.00

4. Effect of Tare test:

Tare Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000028	20.0001	0.0000
	40.000054	40.0001	0.0000
	60.000070	60.0000	0.0001
	80.000098	80.0000	0.0001
	100.000109	100.0000	0.0001

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

o---o-End-o---o

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Certificate of Calibration

Certificate No.: 260318-1-BL007-26

Code No.: BL007-26

Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom suk 41, Sukhumvit Rd., Bang Chak, Phar Khanong, Bangkok 10260

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Asset No.: UAE.WAS.002/2552

Building : UAE No.3 Floor : 1 Room : 107

Received Date: April 2, 2026
Date of Calibration : April 3, 2026

Calibration Conditions: Temperature start 21.9 °C end 22.1 °C
Humidity start 60.6 % end 60.1 %
Pressure start 756.6 mmHg end 755.1 mmHg

Calibrated by: Thanachat Chatpachol

Approved by: Suwit Chotnok

Signature: *ecf*

Issued Date: April 7, 2026

- Note : 1) The Uncertainties are for a confidence probability of approximately 95%
2) This Certificate is valid only to the item calibrated on date and place of calibration.
3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

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Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 3, 2026

Manufacturer: Mettler Toledo
Readability: 0.0001 g
ID No.: UAE.WAS.002/2552

Condition As-Received: In Condition

Condition of Equipment:
Condition of This Result of Calibration:
1. Calibration Method: This instrument was calibrated by method UALP/LAL008 In-house Method based on LAPS Lab 14 : 2022

2. Reference Standards

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (DML)	1 mg to 1 kg	E71041605	NETT FR TOL PNT Zedra	E71041605	Mettler-Toledo	3 May 27

3. This certification is traceable to SI Unit
4. This certification was verified only for the instrument as calibrated
5. This result of calibration was found accurate as shown on date and place of calibration only
6. Through the reference standard laboratory of Mettler-Toledo Serial E71041605, SAS accreditation number 025.0003

Calibration Result:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200*	0.00010

2. Percentile or off-center loading

A mass of 100 g was placed and moved to various position on pan
The Balance reading obtained is given in the table.

1	2	3	4	5	Maximum Difference (g)
100.0025	100.0032	100.0032	100.0029	100.0030	0.0005

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Remarks :

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

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Certificate No. : C26030163

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
Meter Model : HI839800-02 Serial No. : 06480019101
Tube Heater Capacity : 25 Vial Capacity Resolution : 0.1 °C
Temperature Range : (-10 to 160)°C Temperature of Reaction : 150°C
Manufacturer : Hanna Instruments Made in : Romania
Condition As-Received : Used Product Reference : RE760497
Ambient Temperature : (25 ± 2)°C Relative Humidity : (50 ± 15)% RH

Customer name : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak
Phrakhanong, Bangkok 10260

Received date : 12 March 2026

Calibrate date : 17 March 2026

Issue date : 18 March 2026

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibration Procedure : This calibrator was conducted by using in-house: calibration procedure
CP-04 by using certified reference standard instruments.

Calibrated by : Mr. Pichit Petthong

Approved by :

(Mr. Anan Suwanchaisakul)
Authorized Signatory



This certificate was certified only for the instrument we calibrated. This result of calibration was found accurate on date and place of calibration only.

This certificate may not be reproduced other than in full, except with the prior written approval of Hanna Instruments (Thailand) Ltd.

เอกสารไม่ควบคุม

Form EIR 5/1/2026

CERTIFICATE OF CALIBRATION

Certificate No. : SP26-014

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 : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : HITACHI

Model : U-5100

Serial No. : 23A4-008

ID No. : UAE.WAS.010/2567

Received Date : 18 May 2026

Calibration Date : 18 May 2026

Issue Date : 21 May 2026

Condition Instrument : Good

Calibrated by :

(Mr. Paet Mathavorn)
Calibration Engineer

Approved by :

(Ms. Chonticha Sangnern)
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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FM-708-02 R01 1/11/2021

Certificate No. : C26030163

Page : 2 of 2

Condition of this calibration result :

Reference standard instrument : This Certification is traceable to the SI Unit maintained through:

Instrument	Model	Serial No.	Certificate No.	Traceable
Digital Thermo-Hygrometer	HT-7715D	AI.07155	26H106	Technology Promotion Association (Thailand-Japan).
Data Acquisition Switch Unit	34970A	MY44065265	WK2507-171-1	WK Electric Co., Ltd.

Calibration Result :

Measurement Temperature Source Accuracy for COD Reactor.

Capacity	Nominal Value	Average Value	Error	Uncertainty (±)
25 Vials	150.0 °C	150.1 °C	0.1 °C	0.53 °C

Unit : °C

(1A)	(2A)	(3A)	(4A)	(5A)
149.7	149.7	150.1	150.4	150.4
(1B)	(2B)	(3B)	(4B)	(5B)
150.4	150.3	150.2	150.2	150.1
(1C)	(2C)	(3C)	(4C)	(5C)
149.9	150.2	150.0	150.2	149.9
(1D)	(2D)	(3D)	(4D)	(5D)
150.2	150.2	150.0	150.0	150.0
(1E)	(2E)	(3E)	(4E)	(5E)
150.1	149.8	150.2	150.2	149.8

Figure: Shows the location of the temperature source.

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

** End of certificate **

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Form EIR 5/1/2026

REPORT OF CALIBRATION

Certificate No. : SP26-014

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative 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	136858	5 November 2027
Absorbance Standard set	25757	136848	5 November 2027
Wavelength Standard set	25806	136824	5 November 2027
Wavelength Standard set	25758	136827	5 November 2027

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 : 5.0 nm.

Scan Speed of UUC : 40

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

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

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

ISO 15189:2013

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP26-014

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
	0.5772	0.574	0.0032	0.0031	2.00
	1.0478	1.043	0.0048	0.0029	2.00
	2.1879	2.182	0.0059	0.0082	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5581	0.556	0.0021	0.0034	2.00
	1.0224	1.020	0.0024	0.0035	2.00
	2.1227	2.121	0.0017	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5225	0.518	0.0045	0.0029	2.00
	0.9628	0.961	0.0018	0.0028	2.00
	1.9744	1.974	0.0004	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5174	0.514	0.0034	0.0031	2.00
	0.9990	0.996	0.0030	0.0033	2.00
	1.9953	1.995	0.0003	0.0087	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5508	0.549	0.0018	0.0030	2.00
	1.0801	1.078	0.0021	0.0029	2.00
	2.0356	2.028	0.0076	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5579	0.558	-0.0001	0.0031	2.00
	1.0512	1.050	0.0012	0.0029	2.00
	1.9257	1.923	0.0027	0.0083	2.00

FM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.

DQE Services

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LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP26-014

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.00	240.3	0.70	0.18	2.00
279.30	278.9	0.40	0.18	2.00
288.90	288.2	0.70	0.18	2.00
334.50	333.8	0.70	0.18	2.00
361.40	360.7	0.70	0.18	2.00
418.40	417.9	0.50	0.18	2.00
447.20	446.6	0.60	0.18	2.00
459.30	459.4	-0.10	0.18	2.00
537.00	536.5	0.50	0.18	2.00
638.00	637.3	0.70	0.18	2.00
441.29	440.6	0.69	0.18	2.00
479.88	479.7	0.68	0.18	2.00
513.75	513.0	0.75	0.18	2.00
528.59	528.1	0.49	0.18	2.00
575.10	574.5	0.60	0.18	2.00
585.56	585.0	0.56	0.20	2.00
684.70	684.2	0.50	0.18	2.00
740.51	739.9	0.61	0.20	2.00
747.61	747.0	0.61	0.18	2.00
807.04	806.5	0.54	0.18	2.00
879.68	879.0	0.68	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

FM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

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

ISO 15189:2013

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP26-014

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
	0.7455	0.744	0.0015	0.0056	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8656	0.863	0.0026	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2910	0.290	0.0010	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6414	0.640	0.0014	0.0055	2.00

FM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.

DQE Services

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

ISO 15189:2013

LABORATORY DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP26-013

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 : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : UAE.WAT.020/2558

Received Date : 18 May 2026

Calibration Date : 18 May 2026

Issue Date : 21 May 2026

Condition Instrument : Good

Calibrated by :

Mr.Pacit Mathavorn

Calibration Engineer

Approved by :

(Ms.Chonticha Sangngern)

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.

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP26-013Page 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	136858	5 November 2027
Absorbance Standard set	25757	136848	5 November 2027
Wavelength Standard set	25806	136824	5 November 2027
Wavelength Standard set	25758	136827	5 November 2027

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 : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.000 Abs.
Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP26-013Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7455	0.0000 0.7457	0.0000 -0.0002	0.0050 0.0056	2.00 2.00
257	0.0000 0.8656	0.0000 0.8669	0.0000 -0.0013	0.0050 0.0059	2.00 2.00
313	0.0000 0.2910	0.0000 0.2907	0.0000 0.0003	0.0050 0.0051	2.00 2.00
350	0.0000 0.6414	0.0000 0.6414	0.0000 0.0000	0.0050 0.0055	2.00 2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP26-013Page 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 0.5772 1.0478 2.1879	0.0001 0.5731 1.0427 2.1782	-0.0001 0.0041 0.0051 0.0097	0.0028 0.0031 0.0029 0.0075	2.00 2.00 2.00 2.00
440	0.0000 0.5581 1.0224 2.1227	0.0000 0.5574 1.0210 2.1159	0.0000 0.0007 0.0014 0.0068	0.0028 0.0034 0.0035 0.0083	2.00 2.00 2.00 2.00
465	0.0000 0.5225 0.9628 1.9744	0.0000 0.5184 0.9603 1.9698	0.0000 0.0041 0.0025 0.0046	0.0028 0.0029 0.0028 0.0073	2.00 2.00 2.00 2.00
546.1	0.0000 0.5174 0.9990 1.9953	0.0000 0.5150 0.9964 1.9884	0.0000 0.0024 0.0026 0.0069	0.0028 0.0031 0.0033 0.0085	2.00 2.00 2.00 2.00
590	0.0000 0.5508 1.0801 2.0356	0.0000 0.5491 1.0781 2.0274	0.0000 0.0017 0.0020 0.0082	0.0028 0.0030 0.0029 0.0078	2.00 2.00 2.00 2.00
635	0.0000 0.5579 1.0512 1.9257	0.0000 0.5570 1.0491 1.9201	0.0000 0.0009 0.0021 0.0056	0.0028 0.0031 0.0029 0.0079	2.00 2.00 2.00 2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP26-013Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.70	241.6	0.10	0.18	2.00
279.44	279.2	0.24	0.18	2.00
287.71	287.6	0.11	0.18	2.00
334.02	333.5	0.52	0.18	2.00
360.89	360.2	0.69	0.18	2.00
418.53	417.8	0.73	0.18	2.00
445.82	445.2	0.62	0.18	2.00
453.67	453.0	0.67	0.18	2.00
459.99	459.6	0.39	0.18	2.00
536.52	536.4	0.12	0.18	2.00
638.00	638.2	-0.20	0.18	2.00
431.22	430.5	0.72	0.18	2.00
472.66	472.2	0.46	0.18	2.00
513.39	513.3	0.09	0.18	2.00
528.90	528.7	0.20	0.18	2.00
572.99	573.6	-0.61	0.18	2.00
585.19	585.7	-0.51	0.20	2.00
684.50	684.5	0.00	0.18	2.00
741.02	741.2	-0.18	0.20	2.00
748.56	749.0	-0.44	0.18	2.00
807.02	806.8	0.22	0.18	2.00
879.41	879.4	0.01	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. : SP26-012 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 : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : HITACHI

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 18 May 2026

Calibration Date : 18 May 2026

Issue Date : 21 May 2026

Condition Instrument : Good

Calibrated by : Approved by :
(Mr.Pacit Mathavorn) (Ms.Chonticha Sangngern)
Calibration Engineer 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.

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

REPORT OF CALIBRATION

Certificate No. : SP26-012 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
	0.5772	0.575	0.0022	0.0031	2.00
	1.0478	1.043	0.0048	0.0029	2.00
	2.1879	2.197	-0.0091	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5581	0.558	0.0001	0.0034	2.00
	1.0224	1.022	0.0004	0.0035	2.00
	2.1227	2.131	-0.0083	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5225	0.518	0.0045	0.0029	2.00
	0.9628	0.961	0.0018	0.0028	2.00
	1.9744	1.981	-0.0066	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5174	0.515	0.0024	0.0031	2.00
	0.9990	0.997	0.0020	0.0033	2.00
	1.9953	1.995	0.0003	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5508	0.549	0.0018	0.0030	2.00
	1.0801	1.079	0.0011	0.0029	2.00
	2.0356	2.036	-0.0004	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5579	0.558	-0.0001	0.0031	2.00
	1.0512	1.050	0.0012	0.0029	2.00
	1.9257	1.928	-0.0023	0.0079	2.00

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

REPORT OF CALIBRATION

Certificate No. : SP26-012 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	136858	5 November 2027
Absorbance Standard set	25757	136848	5 November 2027
Wavelength Standard set	25806	136824	5 November 2027
Wavelength Standard set	25758	136827	5 November 2027

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 : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

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

REPORT OF CALIBRATION

Certificate No. : SP26-012 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
	0.7455	0.742	0.0035	0.0056	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8656	0.860	0.0056	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2910	0.288	0.0030	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6414	0.635	0.0064	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE

Services

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. : SP26-012

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	241.3	0.42	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	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	445.5	0.44	0.18	2.00
453.66	453.5	0.16	0.18	2.00
460.02	459.5	0.52	0.18	2.00
536.59	536.5	0.09	0.18	2.00
637.98	638.0	-0.02	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	513.3	0.17	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	879.3	-0.02	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-706-02 R01 1/11/2021

Technology



LABOR DETAILS					
Technician	Serial Number	Start Date And Time	End Date And Time	Billable Labor Hour	Billable Travel Hour
Yongyuth Chanphong		05/13/2026 10:00 AM	05/13/2026 5:30 PM		

PARTS USED		
Part No	Part Description	Parts Qty

WORK DETAILS			
Technician	Start Date And Time	Serial Number	Work Description
Yongyuth Chanphong	05/13/2026 10:00 AM		- ทำ PM เรียบร้อย, เครื่องพร้อมใช้งาน - นำ Pump tube 3036 จาก เครื่องใหม่ มาสำรอง จำนวน 6 เส้น - Coil with heat-exchanger 10 turns ชำรุด, แก๊วไฮโดรเจน สามารถใช้งานได้ปกติ

Customer Signature:

Customer Signature

Date: 05/29/2026

Technician: Yongyuth Chanphong
Job Title: Service Manager
Email: yongyuth.yc@dksh.com

Reach us at DKSH Service Hotline : +66 2 639 7000
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260, Thailand

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Page 2 of 2

Technology



Service Report

Customer Details

Location Address:

700/2 หมู่ที่ 1

จังหวัดชลบุรี, 20000

Contact: Isara Bunprakob

Email: isara.b@uaeconsultant.co.th

Tel: +66 2763 2828 Ext 7018

Sold to Organization:

United Analyst and Engineering Consultant Co., Ltd.,

Bangkok-HQ

WORK ORDER DETAILS			
Work Order Number	WO-00120844	PO Number	Q-214543
Order Type	Preventive Maintenance	Billing Type	Chargeable

PRODUCTS SERVICED				
Installed Product Id	Serial Number	Product	Warranty No.	Contract No.
IB-00105024	182688	SKALAR 2SAN59000 SAN++ Classic CFA 230V 2SAN59000		SER_ANALYTICAL1_PM_Re SC_Silver_Skalar_SA5000_182688_25/26

PROBLEM DESCRIPTION	
สอบเทียบเครื่องมือ Continuous Flow Analyzer (CFA) Manufacturer: Skalar Analytical Model: San++5000-02 Serial: 182688 ID : UAE.WAS.043/2561	

WORK PERFORMED	
13 May 2026 - ทำ PM เรียบร้อย, เครื่องพร้อมใช้งาน ** ละโพสที่ควรสำรอง ** 1. Method Ammonia - Pump tube (3026, 3027) - PVC 6.00mm, ID (5155) 2. Method Phenol and Cyanide - Pump tube (3025, 3031, 3035, 3036 = 2 pcs) - Coil with heat-exchanger (5304) - Lubricant (5418)	

Reach us at DKSH Service Hotline : +66 2 639 7000
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260, Thailand

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Page 1 of 2

 TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN) CORPORATE SERVICES 3. EQUIPMENT CALIBRATION AND TESTING SERVICES 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250 TEL 0-2717-3000-29 FAX 0-2719-9484  	
Certificate of Calibration	Cert. No.: 26TM196 Page : 1 of 3
Equipment :	BOD Incubator
Manufacturer :	Arco
Model :	UC4-1320
Serial No. :	13UJRC4S013201
ID No. :	UAE.WAO.015/2561
Submitted by :	United Analyst and Engineering Consultant Co.,Ltd., 3 Soi Udomsuk 41, Sukhumvit Road Bangkok, Phrakhanong Bangkok 10260
Location :	Lab. Floor 2
Received Order :	02 February 2026
Calibration Date :	03 February 2026
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Kriada Malee  Approved Signatory
Approved by :	() Chakrit Waewwanjua () Suwli Imjai (✓) Kunchit Promprat
Issue Date :	17 February 2026
The Uncertainties are for a confidence probability of approximately 95% This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3. Equipment Calibration and Testing Services.	

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2602-0003OC-1

Cert. No.: 261M196
 Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
 The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	25LM117	TPA	17 Jul 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.
 3. This measurement result is traceable to the International System of Unit maintained through ;

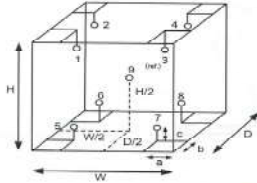
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	25
REL.Humid. (%)	48	49
AC Supply (Volt)	221	220



Probe Installation Details :

Dimension of Chamber :	
a = 10 cm	D = 0.82 m
b = 10 cm	W = 1.2 m
c = 10 cm	H = 1.2 m
	Capacity = 0.89 m ³

Position :	Ref. Std. ID No.:
1	22-18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	25-18RTD-2/6
7	25-18RTD-2/7
8	21-18RTD-2/10
9 (ref.)	18RTD-2/9

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2602-0003OC-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 26TM196
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.65	0.40	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.079	19.917	20.065	19.973	19.943	19.959	19.852	19.860	20.006	0.64

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



ภาคผนวก ง-2

บริษัท ดี.เอ. รีเซิร์ช เซ็นเตอร์ จำกัด

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: F03NIGF80A020
Cylinder Number: LL193324
Laboratory: 124 - Riverton (SAP) - NJ
PGVP Number: B52018
Gas Code: NO,NOX,SO2,BALN
Reference Number: 82-401285019-1
Cylinder Volume: 83.4 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Sep 05, 2018
Expiration Date: Sep 05, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/531, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.71 PPM	GT	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
NITRIC OXIDE	50.00 PPM	50.61 PPM	GT	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
SULFUR DIOXIDE	50.00 PPM	50.54 PPM	GT	+/- 1.0% NIST Traceable	08/27/2018, 09/05/2018
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060025	CC442585	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12388	5604119	29.86 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMS	7042010134	CC503941	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2020
NTRM	14010327	KAL004378	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 NO	FTIR	Aug 09, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Aug 31, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Aug 30, 2018

Triad Data Available Upon Request

NOTES: PQR 5218003935

Net weight: 2736 grams
Gross weight: 17393 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

Approved for Release

Page 1 of 82-401285019-1



Certificate of Calibration

Equipment: Electronic Balance
Manufacturer: Sartorius
Model: ME36S
Serial No.: 27206085
ID No.: -
Condition of the item: Normal
Certificate No.: C01253246
Job No.: WO-00091493
Issued Date: 03 November 2025
Page: 1 of 2
Customer: Integrated Research Center Co., Ltd.
122 Moo 2, Tambol Thatoom,
Amphur Srimahaphote, Prachinburi 25140 Thailand
Environment Condition: Temperature 25 °C ± 0.8 °C
Relative Humidity 68 % ± 2.4 %
Calibration Place: Double A (1991) Public Company Limited.
(Water Laboratory IP1 (Balance Room))
1 Moo 2, Thatoom, Srimahaphot,
Prachinburi 25140 Thailand.
Calibration By: Mr. Piypat Saidoung
Calibration Date: 29 October 2025
The Method Used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02250448

(Mr. Piypat Saidoung)

Person in charge

(Mr. Adisai Maknoi)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories. The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100). These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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Delivering Growth - in Asia and Beyond.

CAL-FM-C01-15: 30 Jun 2025



Certificate No.: C01253246

Page: 2 of 2

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value	10000	(mg)
Reference Points (mg)					
A	B	C	D	E	
-	-0.002	-0.001	0.002	0.001	

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.001 (mg)

Nominal test value (mg)	Standard Deviation
2000	0.0007
20000	0.0008

Error of indication from nominal or conventional mass value., Readability 0.001 (mg)

Nominal Value (mg)	Conventional Mass (mg)	Displayed Value (mg)	Error of indication (mg)	Uncertainty (± mg)	k
1	1.0020	1.002	0.000	0.0033	2.00
5	5.0010	5.001	0.000	0.0033	2.00
10	10.0020	10.001	-0.001	0.0040	2.00
50	50.0000	50.000	0.000	0.0063	2.00
100	100.0040	100.003	-0.001	0.0082	2.00
500	500.0030	500.003	0.000	0.013	2.00
1000	1000.0120	1000.012	0.000	0.016	2.00
5000	5000.0120	5000.011	-0.001	0.027	2.00
10000	10000.0100	10000.005	-0.005	0.033	2.00
20000	20000.0070	20000.001	-0.006	0.048	2.00
30000	30000.0170	30000.010	-0.007	0.080	2.00

The End of Certificate

ใบตรวจสอบสภาพเครื่องชั่ง
Electronic Balance Checklist

Equipment: Electronic Balance

Certificate No.: C01253246

Model: ME36S

Job No.: WO-00091493

Serial No.: 27206085

Check date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
29 Oct 2025			29 Oct 2025		
(Normal)	(Defective)		(Normal)	(Defective)	
		General			
☒	☐	1. สายไฟ/ อะแดปเตอร์ (Electrical wire/ Adaptor)	☒	☐	
☒	☐	2. ความสมบูรณ์ชุดการยกกันลม (Cover)	☒	☐	
☒	☐	3. ความสมบูรณ์ของระดับน้ำ (Bubble spirit level)	☒	☐	
☒	☐	4. ความสมบูรณ์ของชุดขาตั้งเครื่อง (Leveling foot)	☒	☐	
☒	☐	5. การตอบสนองของปุ่มกด (Keys)	☒	☐	
☒	☐	6. ความสมบูรณ์ของหน้าจอ (Display)	☒	☐	
☒	☐	7. การแสดงผลของหน้าจอ (Screen display)	☒	☐	
☒	☐	8. ชุดรองจานชั่ง (Stopper/ Pan support)	☒	☐	
☒	☐	9. การทำงานของฟังก์ชัน (Internal/ External Function)	☒	☐	
☒	☐	10. ความสะอาดของตัวเครื่องภายนอก (External cleanliness of the balance)	☒	☐	
☒	☐	11. สภาพแวดล้อม ณ สถานที่ตั้งเครื่องชั่ง (Environment at the location of the balance)	☒	☐	

ข้อควรระวัง/ Note :

Mr. Piypat Saidoung

Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2333 หมู่ 2 ตำบลบางปูใหม่ อำเภอเมืองสมุทรปราการ 10280
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Delivering Growth - in Asia and Beyond.

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: F03N199F80A0020 Reference Number: 82-401285019-1
Cylinder Number: LL193324 Cylinder Volume: 83.4 CF
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2215 PSIG
PGVP Number: B52018 Valve Outlet: 660
Gas Code: NO,NOX,SO2,BALN Certification Date: Sep 05, 2018

Expiration Date: Sep 05, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical uncertainty. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.71 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
NITRIC OXIDE	50.00 PPM	50.67 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
SULFUR DIOXIDE	50.00 PPM	50.54 PPM	G1	+/- 1.0% NIST Traceable	08/27/2018, 09/05/2018
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16050025	C442585	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12388	5604119	29.86 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMS	7542010104	CC503841	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2024
NTRM	14010327	KAL004378	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 NO	FTIR	Aug 09, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Aug 31, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Aug 30, 2018

Triad Data Available Upon Request

NOTES:PO# 5218003935

Net weight: 2736 grams
Gross weight: 17393 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



Approved for Release

Page 1 of 82-401285019-1



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Sol 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-68/0221

MTC.No.23-68/0221

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : PERSONAL AIR PUMP SAMPLING PUMP CALIBRATION

Manufacturer : MesaLabs

Serial No.: 210155

Model : Defender 510

Scale range : 50 ml/min to 5000 ml/min

Subdivision : (0.00001, 0.0001) l/min

Submitted by : INTEGRATED RESEARCH CENTER COMPANY LIMITED.

122 T.Thatoom A.Srimahaphote,

Prachinburi 25140, Thailand.

Received date : 15 January 2025 Condition of measured item : Normal

Calibration date : 3 February 2025

Standard	Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 0811/67	3-Jul-26	TISTR	
Box/Pressure Transducer/UpStream	MP-0076-23	2-Apr-25	NIMT	
Primary Flow Calibrator S/N 119521	MW-0033-23	6-Jun-25	NIMT	

Calibrated by :
(Mr.Terasak Panna)Approved by :
(Ms.Krana Luanghirun)
Director
Mechanical Engineering Standards Laboratory

Ref. 2013268011500202001

Issued Date 5 February 2025

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FM.BLMTC.002 Rev.5

CERTIFICATE OF CALIBRATION

Certificate No. : COF-022-68

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Office
MANUFACTURER : TISCH
MODEL/TYPE : TE-5028A
SERIAL NUMBER : 2826
ID NUMBER : -
CONDITION AS-RECEIVED : -
CUSTOMER : -
RECEIVED DATE : 05 Jun 2025
MEASUREMENT DATE : 12 Jun 2025
ISSUE DATE : 13 Jun 2025

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:
Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 22.7 °C and 52.1 %RH.

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

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibration procedure:
The Office gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model GSG/THC-WF-do. The 16-CL-004 was used as a calibration guideline.

Traceability:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [T ₀] °C	Temperature [T ₁] °C	Ap_meter mmHg	Ap_Office mmHg	y	Standard Flow [Q _s] m^3/min
1	0.696	752.986	22.65	22.05	60.043	1.071	1.034	0.643
2	1.003	752.904	22.57	21.90	44.794	2.326	1.524	0.944
3	1.120	752.767	22.83	22.21	39.589	2.939	1.712	1.061
4	1.167	752.907	22.91	22.32	37.026	3.231	1.795	1.109
5	1.417	752.831	23.13	22.57	25.460	4.930	2.217	1.358

Slope (m): 1.62233
Intercept (b): -0.01636
Correlation coefficient (r): 0.99980
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [T ₀] °C	Temperature [T ₁] °C	Ap_meter mmHg	Ap_Office mmHg	y	Standard Flow [Q _s] m^3/min
1	0.696	752.986	22.65	22.05	60.043	1.071	0.649	0.644
2	1.003	752.904	22.57	21.90	44.794	2.326	0.956	0.945
3	1.120	752.767	22.83	22.21	39.589	2.939	1.075	1.063
4	1.167	752.907	22.91	22.32	37.026	3.231	1.127	1.112
5	1.417	752.831	23.13	22.57	25.460	4.930	1.393	1.372

Slope (m): 1.02238
Intercept (b): -0.01025
Correlation coefficient (r): 0.99981
Uncertainty (k=2): 0.015 m^3/min

End of Certificate of Calibration



Calibrated by:
☐ Mr. Sorawat Thachalad
☒ Miss Jittaporn Lertsomphol

Approved signature
Mr. Parinya Booncharoen
Calibration Department Manager



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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTN No. EEL. BP. 91/0168

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.
Address : 122 Moo 2, T.Thatoom, A.Srimahaphote, Prachinburi, 25140.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre:
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.
Instrument Calibrated:
Description : Integrating Sound Level Meter
Manufacturer : ACO
Model : 6226
Serial No. : 100146
Microphone : Type 7052NR No.78402
Preamplifier : -

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

Standards used:
1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjaer 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Sound Calibrator Brüel&Kjaer 4231 S/N 3015154.
7. Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.

Date of Receipt : 14 Jan. 2025
Date of Calibration : 17-18 Feb. 2025

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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTN No. EEL. BP. 91/0168

- Power Amplifier Brüel&Kjaer 2706 S/N 1517650.
- Speaker Tannoy Limited, Great Britain British Patent No: 2153300.
- Digital Multimeter Agilent 34401A S/N MY44005560.
- Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure:

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

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

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

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

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL. BP. 91/0168

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
93.99	92.7	94.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 95.1 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
23.1	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	22.5	0.10	N/A
C-Weight	27.6	0.10	N/A
Flat	30.1	0.10	N/A

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL. BP. 91/0168

5. Long-term stability

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

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

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

6.2 Time weightings at 1 kHz

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

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL. BP. 91/0168

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.7	0.5	0.0	1.5	0.45	0.6
1 000	0.2	0.1	0.1	1.0	0.45	0.6
8 000	-4.4	-4.2	-4.4	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.3	0.1	0.1	2.0	0.20	0.6
125	0.1	0.1	1.3	1.5	0.20	0.6
250	0.1	0.1	0.1	1.5	0.20	0.6
500	0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	0.1	2.0	0.20	0.6
4 000	-0.4	-0.2	0.0	3.0	0.20	0.6
8 000	-0.3	-0.2	-0.1	5.0	0.20	0.7

Date of Calibration : 17-18 Feb. 2025

4 / 9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL. BP. 91/0168

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	121.8	-0.2	1.1	0.30	0.3
121	120.9	-0.1	1.1	0.30	0.3
120	119.9	-0.1	1.1	0.30	0.3
119	118.9	-0.1	1.1	0.30	0.3
114	113.9	-0.1	1.1	0.30	0.3
109	108.9	-0.1	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.1	0.1	1.1	0.30	0.3
79	78.9	-0.1	1.1	0.30	0.3
74	73.9	-0.1	1.1	0.30	0.3
69	68.9	-0.1	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.8	-0.2	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	44.2	0.2	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	34.1	0.1	1.1	0.30	0.3
33	33.2	0.2	1.1	0.30	0.3

Date of Calibration : 17-18 Feb. 2025

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
32	32.3	0.3	1.1	0.30	0.3
31	31.4	0.4	1.1	0.30	0.3
30	30.4	0.4	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle			
131.1	131.1	0.0	1.5	0.20

12. High-level stability

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

Calibrated by 
(Mr. Pannasit Phasingsri)

Approved by : 
(Mr. Pravee Kluyapa)

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

Date of Calibration : 17-18 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268011400185009

End of Certificate

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8. Level linearity including the level range control

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

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.8	0.8	1.1	0.30	0.3
20-100	25	25.8	0.8	1.1	0.30	0.3
20-90	25	25.6	0.6	1.1	0.30	0.3
20-80	25	25.7	0.7	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.8	-0.2	±1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 17-18 Feb. 2025

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CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2, T. Thathom, A. Srimahaphote, Prachinburi, 25140.

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

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

Instrument Calibrated :

Description : Integrating Sound Level Meter

Manufacturer : ACO

Model : 6226

Serial No. : 100145

Microphone : Type 7052NR No.78402

Preamplifier : -

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AI-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Sound Calibrator Brüel&Kjær 4231 S/N 3015154.
7. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Date of Receipt : 14 Jan. 2025

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL BP. 90/0168

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

Calibration Procedure:

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

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

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

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

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL BP. 90/0168

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.4	0.1	-0.1	1.5	0.45	0.6
1 000	0.1	0.2	0.2	1.0	0.45	0.6
8 000	-4.2	-3.6	-4.4	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.1	0.1	0.1	2.0	0.20	0.6
125	0.1	0.1	0.1	1.5	0.20	0.6
250	0.1	0.1	0.1	1.5	0.20	0.6
500	0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	0.1	2.0	0.20	0.6
4 000	-0.3	-0.1	0.0	3.0	0.20	0.6
8 000	-0.3	-0.1	-0.1	5.0	0.20	0.7

Date of Calibration : 17-18 Feb. 2025

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL BP. 90/0168

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
93.99	92.9	94.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 117.0 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
25.3	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	24.5	0.10	N/A
C-Weight	26.7	0.10	N/A
Flat	31.3	0.10	N/A

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0160

MTC No. EEL BP. 90/0168

5. Long-term stability

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

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

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

6.2 Time weightings at 1 kHz

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

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	121.9	-0.1	1.1	0.30	0.3
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119	119.0	0.0	1.1	0.30	0.3
114	113.9	-0.1	1.1	0.30	0.3
109	108.9	-0.1	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.9	-0.1	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
33	33.1	0.1	1.1	0.30	0.3

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8. Level linearity including the level range control

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

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.4	0.4	1.1	0.30	0.3
20-100	25	25.5	0.5	1.1	0.30	0.3
20-90	25	25.6	0.6	1.1	0.30	0.3
20-80	25	25.5	0.5	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.8	-0.2	±1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 17-18 Feb. 2025

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FMBL.MTC.002 Rev.5

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
32	32.2	0.2	1.1	0.30	0.3
31	31.2	0.2	1.1	0.30	0.3
30	30.3	0.3	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 17-18 Feb. 2025

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10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle	1.5	0.20	0.25
131.1	131.1	0.0	1.5	0.20

12. High-level stability

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

Calibrated by :
(Mr. Pannasit Phasingsri)

Approved by :
(Mr. Pravitte Khuyyap)

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 17-18 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268011400185008

End of Certificate

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Request No. 22-68 / 0230

MTC No. PSL-H 0065 / 68

Certificate of Calibration

Customer : Integrated Research Center Company Limited
122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : HD32.2

Serial Number : 10027484

Manufacturer : Delta OHM

Date of Request : 14 January 2025

Date of Calibration : 30 January 2025

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WLCP.18.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :

Approved by :

(Ms. Panit Thummasri)

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012268011400191001

Issued Date : 13 February 2025

Page 1 of 4

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FM.BLMTC.002 Rev.3

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Request No. 22-68 / 0230

MTC No. PSL-H 0065 / 68

Results of Calibration :- (✓) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb (T_w)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
19.8	19.8	0.0	0.50
30.0	29.9	0.1	0.50
39.9	39.8	0.1	0.50

Table : Temperature Measurement @ Dry Bulb (T)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
19.8	19.8	0.0	0.50
30.0	29.7	0.3	0.50
39.9	39.6	0.3	0.51

Page 3 of 4

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FM.BLMTC.002 Rev.3

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Request No. 22-68 / 0230

MTC No. PSL-H 0065 / 68

Description of Unit Under Calibration :

Customer : Integrated Research Center Company Limited

Address : 122, T.Thatoom, A.Srimahaphote, Prachinburi, 25140

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Serial Number : 10027484

Calibration Required : Temperature at (20, 30, 40) °C

Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %

Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0865-1/67.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WLCP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Page 2 of 4

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Request No. 22-68 / 0230

MTC No. PSL-H 0065 / 68

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb (T_g)

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
19.8	20.2	-0.4	0.50
30.0	30.1	-0.1	0.53
39.9	39.9	0.0	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Page 4 of 4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0159

MTC No. EEL. BP. 80/0168

CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2, T.Thatoom, A.Srinahaphote, Pachinburi, 25140.

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

Instrument Calibrated :

Ambient Environment

Description : Sound Calibrator

Temperature : (23 ± 3) °C

Manufacturer : ACO

Relative Humidity : (50 ± 15) %

Model : 2127

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 100012

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

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

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

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

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

Date of Receipt : 14 Jan. 2025

Date of Calibration : 21 Jan. 2025

1/2

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FM.BLMTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0159

MTC No. EEL. BP. 80/0168

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

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

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

1. Sound Pressure Level

Standard Microphone	Measured Sound Pressure	Deviated value	Uncertainty	Tolerance limit
Type	Level (dB)	(dB)	(dB)	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.91	-0.09	± 0.10	±0.40 dB

2. Frequency

Standard Microphone	Measured Frequency	Deviated value	Uncertainty	Tolerance limit
Type	(Hz)	(Hz)	(Hz)	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	±1.0%

3. Total Distortion

Standard Microphone	Measured Total Distortion	Uncertainty	Tolerance limit
Type	(%)	(%)	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.50	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Pongsak Kiatypa)

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

Date of Calibration : 21 Jan. 2025

Date of Issue : 23 Jan. 2025

Ref : 2011268011400184001

End of Certificate

2/2

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ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



ภาคผนวก จ-1

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

ที่ อก ๐๓๑๐(๑)/ ๑๐๘๔



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๗ กุมภาพันธ์ ๒๕๖๕

เรื่อง ต่อยานหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูไนเต็ด แอนาไลติก แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอใบสมัครของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๓ ธันวาคม ๒๕๖๔

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕๐ ราย
๒. รายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๔๑ ราย
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามคำขอที่อ้างถึง บริษัท ยูไนเต็ด แอนาไลติก แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด ขอต่ออายุ หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยสุขุมวิท ๔๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูไนเต็ด แอนาไลติก แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด ต่อยานหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๔๑ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำ/น้ำเสีย น้ำใต้ดิน อากาศเสีย

สิ่งปฏิบัติหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงาน อุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรวัฒน์ อิศรางกูร ณ อยุธยา)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม
UAE UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

สำเนาถูกต้อง R/K

กองวิจัยและเคอีนกยณสถพิชโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการวิเคราะห์

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓

ไปรษณีย์อิเล็กทรอนิกส์ sarabangjitwong@mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"

- ๒ -

- ๓๖) นายนาเคนทร์ พันธุ์ชาติกุล
๓๗) นายกันตพงศ์ บุญทอง
๓๘) นายสุรธรรม นกขื่อนอก
๓๙) นางสาวอรอนงค์ โพธิ์ชัยพิทักษ์กุล
๔๐) นางมานิตา แฉะไย

- ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๑๐
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๑๑
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๑๒
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๑๓
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๑๔

๒๕/๖/๖๕

UAE UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY LIMITED

สำเนาถูกต้อง R/K

เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอนาไลติก แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕

ที่ อก ๐๓๑๐(๑)/ ๑๐๘๔ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕๐ ราย

- ๑) นางสาวกนกวรรณ กัทธิรักษ์กุล
- ๒) นายณรงค์ อิมพาลี
- ๓) นางสาวนันทิศา บุญไชย
- ๔) นางปิยะพัชร สุทนต์วงษ์
- ๕) นางสาวบุญจรรณ วีรียัตย์
- ๖) นายพนรัตน์ วงศ์อุไรรัชชัย
- ๗) นางสาววิมลวรรณ บุญสุลา
- ๘) นายสุวิทย์ จิตตนอก
- ๙) นางสาวจิตติภา สมบูรณ์
- ๑๐) นางสาวบุษกร เสือคาณนา
- ๑๑) นางสาววิไลลักษณ์ ศรีสุข
- ๑๒) นายศิลา บรรจงใจรักษ์
- ๑๓) นายปฏิกรณ์ คณะนา
- ๑๔) นายธีรวัฒน์ ขว่มิ่ง
- ๑๕) นางสาวศิริพร ศรีประติษฐ์
- ๑๖) นางสาวสาริณี วัชร
- ๑๗) นางสาวพนพรรณ สุราษฎร์
- ๑๘) นายภูษณชัช ธานีเลิศคำไพ
- ๑๙) นายณัฐวัฒน์ แสงสวัสดิ์
- ๒๐) นายเอกรัตน์ ปะดามันท์
- ๒๑) นางสาวนิศาพิณ ศรีสกุลสิทธิ์ไพ
- ๒๒) นางสาวเจษฎาจันทร์ ทาสอาด
- ๒๓) นางสาวสุวรรณ คพทอง
- ๒๔) นางสาววรรณ พัดทองชัย
- ๒๕) นายวิรัชกุล โมกแก้ว
- ๒๖) นายวิรัชพร เทพดนตรี
- ๒๗) นายอนุชาสน์ สายดี
- ๒๘) นายกรวิทย์ เชิดศิริสกุล
- ๒๙) นายสุพริช อุดมจันทร์
- ๓๐) นางสาวทัศนีย์ อ่อนคำ
- ๓๑) นางพรพรรณ กอนสิน
- ๓๒) นายคุณนัฐ คุณคนกาญจน์
- ๓๓) นางสาวศิริพร เถื่อนน
- ๓๔) นางศิวานี ชำนิ
- ๓๕) นางสาวพรวิภา ธีระจินดา

- ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๐๑
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๐๒
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ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๓๗
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ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๔๐

๒๖) นายนาเคนทร์...

เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอนาไลติก แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕

ที่ อก ๐๓๑๐(๑)/ ๑๐๘๔ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๕

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๔๑ ราย

- ๑) นายสุสิทธิ์ พันธุ์
- ๒) นายพิรุณ เจริญผล
- ๓) นางสาววิไลลักษณ์ เกื้อสง
- ๔) นายสมชาติ สุทธิรัตน์
- ๕) นางสาวปรมาภรณ์ ทองแก้ว
- ๖) นางสาวกัญญา สมพงษ์
- ๗) นางสาววรรณ สายบุญเรือน
- ๘) นายกฤษณพงษ์ นามทิพย์
- ๙) นางสาวอรอนงค์ อ่อนคง
- ๑๐) นายพิศศักดิ์ ทรงจำรัส
- ๑๑) นางสาวอัครินทร์ บุญทอง
- ๑๒) นางสาวพรพิมล แว่นทอง
- ๑๓) นายอภิวิชญ์ พ่วง
- ๑๔) นายมานิต ปานโชติ
- ๑๕) นายพรพร ธนะพิรุณ
- ๑๖) นางสาวกัญญา ธิยา
- ๑๗) นางสาวภาณุ สุทธิ
- ๑๘) นางสาวณณณัฐ อภิสิทธิ์ปาก
- ๑๙) นายศิริพร จงมฤตย์
- ๒๐) นางสาวสุภาวดี อินยาศรี
- ๒๑) นายพงศ์เทพ เหล่าจระ
- ๒๒) นายวิญญู พันทุภัก
- ๒๓) นางสาวพัชรา ศิริคำ
- ๒๔) นางสาวเมธิกา เลิศคำจันทร์
- ๒๕) นายพิเชษฐ์ ปัญญศิริศิลป์
- ๒๖) นายชัชวาล์ เลื่อนถ้อง
- ๒๗) นายณณณัฐ อุดมรัตน์
- ๒๘) นายกันตพงศ์ ระไล
- ๒๙) นายวิญญู กลมเกลียว
- ๓๐) นายธีรวัฒน์ มาตรไพสิริ
- ๓๑) นายบุญฤทธิ์ กอนสิน
- ๓๒) นายพรชัญญ์ โกลกุล
- ๓๓) นายชิตะ แสงจันทร์
- ๓๔) ว่าที่ร้อยตรีณัฐพงศ์ เมืองชัย
- ๓๕) นายอนันต์ เลิศประเสริฐ

- ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๐๑
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๐๒
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ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๓๙
ทะเบียนเลขที่ ๖-๑๔๕-๙-๐๐๔๐

๒๖) นางสาวนิภาพร...

๓๖) นางสาวนิภาภา ขันขุนทด
๓๗) นายนรเมศ สุวสุธอพัฒน์
๓๘) นายประจักษ์ ภู่งอก
๓๙) นายสุวิทย์ นิธิจิตต์ชูวงศ์
๔๐) นายอัมย์ภูชา ณยศศิริ
๔๑) นายเอกภูพิง ใสโยท
๔๒) นายสุเชษฐ์ พันธุ์เรือง
๔๓) นายอนุชิต หาญเกษม
๔๔) นายอิทธิฤทธิ์ ศรีวัฒนแก้ว
๔๕) ว่าที่ร้อยตรีสุวิทย์ แก้วรวมสุข
๔๖) นางสาววราภรณ์ วิสาขนาถ
๔๗) นายศุภกร บวรจันทร์
๔๘) นางสาวจิราจินตนา เปลี่ยนศรี
๔๙) นางสาวกรรณธราภา งามบุญผ่อง
๕๐) นางสาวอรวิยา พรหมภัก
๕๑) นายจิรวัฒน์ สุขเกษม
๕๒) นายพิพัฒน์ สอนชัยภูมิ
๕๓) นายอนุพงษ์ แสนเพชร
๕๔) นางสาวพัทธพรวิมล แสงฟ้า
๕๕) นายรัตนันท์ เพ้ามา
๕๖) นายอิทธิพงษ์ ศรีวิเศษ
๕๗) นางสาวกรรณิการ์ ส้าพา
๕๘) นางสาวณัฐชา พรหมศิริ
๕๙) นายณภัสกร ศรีศิริภัก
๖๐) นางสาวอัสสัณฐา จันทร์สุข
๖๑) นายศักดิ์ศิธรนต์ ภูมิคุ้ม
๖๒) นายวราพงษ์ นพพรรัตน์
๖๓) นางสาวธนชาดา มาะมาศ
๖๔) นายณัฐวิชัย พรหมวรจักร
๖๕) นายปริญญ์ พานแก้ว
๖๖) นายปรีชาพัฑฒ์ โสภ
๖๗) นายวิจิตรพันธ์ แสนงาม
๖๘) นายอาทิตย์ อุทุมผล
๖๙) นายอาทิตย์เดช ใจบุญ
๗๐) นางสาวณิศา พงษ์สุธาพน
๗๑) นายณัฐวุฒิ เขมรัตน์บัว
๗๒) นางสาวมาศภา แหวงนิมิต
๗๓) นางสาวณิชากร นิมา

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๔๙๘) นายบันทวิชัย...

๗๓) นายนิพนธ์รัตน์ วงศ์คำ
๗๔) นายประสิทธิ์พรชัย เล็กนาง
๗๕) นางสาวกัญญา ทรัพย์
๗๖) นางสาวกัญญา ทรัพย์
๗๗) นางสาวกมลพร จันทนากุล
๗๘) นางสาวกมลพร อนุญกุล
๗๙) นายอมรพล อมรสิทธิ์
๘๐) นายอภิเดช หอทิพย์
๘๑) นางสาวเนืองนิจ สุรสาวิทย์
๘๒) นางสาวเนืองนิจ สุรสาวิทย์
๘๓) นายคุณวัฒน์ พูลสารณานนท์
๘๔) นายชาญณรงค์ อ้อย
๘๕) นางสาวจิรฉัตร ศรีวรรณ
๘๖) นายอุทิศ ไพบ่เงิน
๘๗) นายเชษฐา ชัยทวีภ
๘๘) นายชพร เสงี่ยมสิน
๘๙) นายโชคชัย ห่อไท
๙๐) นายชัย บัณฑิต
๙๑) นางสาวอรอุยา ประสานศรี
๙๒) นายพศุต งามนิม
๙๓) นายศุภกร เปรมศรี
๙๔) นายศุภพล ศิลาพันธ์
๙๕) นายโชคชัย ห่อไท
๙๖) นายธีรวัฒน์ ธรรมสุวรรณ
๙๗) นายนิพนธ์ศักดิ์ แซ่บุตร
๙๘) นางสาวนันทิดา พลนิกกิจ
๙๙) นางสาวนันทิพร ทองบุ
๑๐๐) นางสาวพศิลา ชरणนิตย์
๑๐๑) นางสาวนันทิยา ออทอง
๑๐๒) นางสาวนันทิยา แซ่สงวน
๑๐๓) นายศิริวิทย์
๑๐๔) นายสุพล ละคร
๑๐๕) นางสาวสุภัทรา เลื่อนเงิน
๑๐๖) นางสาวพรพรรณ หะ
๑๐๗) นายธนวัฒน์ มุ
๑๐๘) นางสาวพรพรรณ ประ
๑๐๙) นางสาวศิริพร บุญ
๑๑๐) นางสาวสุวิภา แก
๑๑๑) นายสิทธิพร พร
๑๑๒) นางสาวนันทิยา
๑๑๓) นางสาวนันทิยา

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(๓๓๓) นางสาวปิตีญา...

๓๓๓) นางสาวปติยา พูลเกียรติ
๓๓๔) นางสาวเสนาทิพย์ โพธิ์พันธ์
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๓๓๗) นางสาวพิชารัตน จงจิตร
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เอกสารแนบท้ายหนังสือต่ออาัยุรบัณฑิตเพียยนห้องปฏิบัติการวิเคราะห้เอกชน
บริษัท ยูนิเทค แอแนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน 7-๑๔๕
ที่ อก ๐๓๐๑(๑)/ ๑๐๘๕ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๘

ขอขายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๗ รายการ
เมื่อวันที่ ๑๕ ธันวาคม ๒๕๖๒

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
4	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
5	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
6	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
7	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽⁴⁾ 2) Closed Reflux, Colorimetric Method ⁽⁴⁾ 3) Open Reflux, Titrimetric Method ⁽⁴⁾
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽⁴⁾ 2) Total Cyanide after Distillation, by Flow Injection Analysis Method ⁽⁴⁾
16	o,p' -DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾

25 Endrin aldehyde

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	Formaldehyde	Distillation, Colorimetric Method ⁽²⁾
27	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) DPD Ferrous Titrimetric Method ⁽⁴⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Hexavalent Chromium	Colorimetric Method ⁽⁴⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried from 103 to 105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

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ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
8	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

14 Benzo(a)pyrene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

29 Chlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

43 Di-n-butyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

61 2,4-Dinitrotoluene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

74 α -HCH...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
74	α -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
75	β -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
76	γ -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

87 Methylene chloride...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
87	Methylene chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

100 Phenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
103	Silver	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
109	TPH (C ₅ - C ₆)	1) Purge and Trap, Gas Chromatographic Method ^(12,22) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(22,23)
110	TPH (C ₇ - C ₁₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
111	TPH (C ₁₁ - C ₃₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

116 2,4,5-Trichlorophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
119	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾

ภาคผนวก (ปล่องระบาย) จำนวน 25 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
4	Carbon Monoxide	Instrumental Analyzer Method ⁽³⁾
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾

Chromium (ต่อ)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
6	Chromium (ต่อ)	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
9	Cresol	Absorption Sampling, Gas Chromatographic Method ⁽³⁾
10	Dioxins/Furans	Isokinetic Sampling ⁽³⁾
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽³⁾
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽³⁾
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
18	Opacity	Ringelmann's Method ⁽¹⁾
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ⁽³⁾ 2) Instrumental Analyzer Method ⁽³⁾
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽³⁾ 2) Instrumental Analyzer Method ⁽³⁾
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽³⁾

23 Total Suspended Particulate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽³⁾
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
25	Xylene	1) Bag Sampling, Gas Chromatographic Method ⁽³⁾ 2) Adsorption Sampling, Gas Chromatographic Method ⁽³⁾

สิ่งก่อกวนหรือวัตถุที่ไม่ใช่ตัว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,14)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)

8 Chromium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
9	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^(3,6,15,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^(3,6,14,17) 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,17) 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(3,17) 2) Alkaline Digestion, Colorimetric Method ^(8,17)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
13	2,4-D	1) Waste Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)

15 DDE

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(3,19) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(7,19) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)

Mercury (IIb)

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
22	Mercury (IIb)	5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²⁸⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,24) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24)

Polychlorinated Biphenyls(IIb)

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated Biphenyls(IIb) - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5',6'-Heptachlorobiphenyl - 2,2',3,4,4',5,5',6'-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3,9,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
28	pH	Electrometric Method ^(31,32)
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3,6,21) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,21) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)

32 Toxaphene

ลำดับ	สารพิษ	วิธีวิเคราะห์
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,25) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3,12,27) 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3,12,27) 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)

สิ้น จำนวน 125 รายการ

ลำดับ	สารพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25)

Anthracene (10)...

ลำดับ	สารพิษ	วิธีวิเคราะห์
4	Anthracene (ต่อ)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,14)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(7,14)
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
10	Benzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^(7,14)

17 Bis(2-chloroethyl)ether...

ลำดับ	สารพิษ	วิธีวิเคราะห์
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
26	Carbon tetrachloride	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

33 Chromium...

ลำดับ	สารพิษ	วิธีวิเคราะห์
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,17) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,17)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,17)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(29,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁴⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)

45 1,3-Dichlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
48	1,1-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
49	1,2-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
50	1,1-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
51	cis-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
52	trans-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
66	Ethylbenzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)

Heptachlor epoxide (ต่อ)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide (ต่อ)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
74	α -HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
75	β -HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
76	γ -HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)

83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁷⁾ 2) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²⁰⁾
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
87	Methylene chloride	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
96	Polychlorinated Biphenyls -Aroclor 1016	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)

Polychlorinated Biphenyls(ต่อ)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls(๒๐) - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'- Pentachlorobiphenyl - 2,2',4,5,5'- Pentachlorobiphenyl - 2,3,3',4,6- Pentachlorobiphenyl - 2,2',3,4,4',5'- Hexachlorobiphenyl - 2,2',3,4,5,5'- Hexachlorobiphenyl - 2,2',3,5,5',6- Hexachlorobiphenyl - 2,2',4,4',5,5'- Hexachlorobiphenyl - 2,2',3,3',4,4',5- Heptachlorobiphenyl - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4,4',5,6- Heptachlorobiphenyl - 2,2',3,4,4',5,5',6- Heptachlorobiphenyl - 2,2',3,3',4,4',5,6- Nonachlorobiphenyl	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26)  สำนักงานคุ้มครอง R/h อนุ 97 Pentachlorophenol...

97 Pentachlorophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,21) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,14)
103	Styrene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
105	Tetrachloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
106	Toluene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
108	TPH (C ₅ -C ₉)	1) Purge and Trap, Gas Chromatographic Method ^(13,27) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
109	TPH (C ₁₀ -C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
110	TPH (C ₁₇ -C ₃₃)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

111 1,2,4-Trichlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
114	Trichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,14)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
121	m-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
122	o-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
123	p-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
124	Xylene (Total)	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)

125 Zinc...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)

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สำเนาถูกต้อง



ภาคผนวก จ-2

บริษัท ดี.เอ. รีเซิร์ช เซ็นเตอร์ จำกัด



๐๕ มกราคม ๒๕๖๕

เรื่อง ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

อ้างถึง ค่อขอขึ้นทะเบียน/ค่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๖ ตุลาคม ๒๕๖๔สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือค่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด จำนวน ๓ แผ่นตามคำขอที่อ้างถึง บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด ขอค่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๙๙๙ สถานที่ตั้งเลขที่ ๑๒๒ หมู่ ๒ ตำบลท่าตูม
อำเภอศรีมหาโพธิ์ จังหวัดปราจีนบุรี ค่อกรมโรงงานอุตสาหกรรม นั้นกรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด ค่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน

- | | |
|---------------------------------|-----------------------------|
| ๑) นางสาววิไลรัตน์ เกียรติอนชัย | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๑ |
| ๒) นางสาวทิติยา นันทะนิน | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๒ |
| ๓) นางวิมลรัตน์ ผลเจริญ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๓ |
| ๔) นางสาวชนนิภาณต์ แสนสุข | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๔ |

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

- | | |
|---------------------------------|-----------------------------|
| ๑) นายไกรวิชญ์ แสงแก้ว | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๑ |
| ๒) นางสาวณัฐนันท์ สิงวาลวงษ์ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๒ |
| ๓) นางสาวหนึ่งฤทัย อามลธิ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๓ |
| ๔) นางสาวแววตา คำสา | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๔ |
| ๕) นายจักรวิทย์ อินตะ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๕ |
| ๖) นางจุฬารัตน์ เปี้ยสุระ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๖ |
| ๗) นางสาวชลธิชา อนุวัฒน์นพไพศาล | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๗ |
| ๘) นางสาวสุปราณี พุทธิแก้ววงศ์ | ทะเบียนเลขที่ ๖-๑๙๙๙-๙-๐๐๐๘ |

ค. ขอบข่าย ...



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



- ๒ -

ค. ขอบข่ายชนิดสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย/น้ำทิ้ง
จำนวน ๒๑ รายการ น้ำใต้ดิน จำนวน ๑๓ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๔ รายการ
รวมทั้งสิ้น ๔๕ รายการ ตามสิ่งที่ส่งมาด้วยหนังสือฉบับนี้จะสิ้นสุดอายุในวันที่ ๑๕ พฤศจิกายน ๒๕๖๕ หากประสงค์จะค่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอค่ออายุพร้อมเอกสารประกอบคำขอค่อกรมโรงงาน
อุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จักรพันธ์)

 วิทยาลัยอาชีวศึกษาชลบุรี วิทยาลัยอาชีวศึกษา
ผู้อำนวยการวิทยาลัยอาชีวศึกษาชลบุรี
ผู้บริหารการพัฒนาระบบสารสนเทศ
ผู้บริหารการพัฒนาระบบสารสนเทศ
กองวิจัยและพัฒนาผลิตภัณฑ์โรงงาน
ศูนย์วิจัยและพัฒนาผลิตภัณฑ์โรงงานภาคตะวันออก
โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๓-๒
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“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



- ๒ -

เอกสารแนบท้ายหนังสือค่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด เลขทะเบียน ๖-๑๙๙๙

ที่ อก ๐๓๑๐(๑)/ ๑๑๐

ลงวันที่ ๐๕ มกราคม ๒๕๖๕

ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๕ รายการ

น้ำดื่มเสีย จำนวน ๒๓ รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma Method ^[2]
2	Barium	Digestion, Inductively Coupled Plasma Method ^[2]
3	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane-Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
4	Cadmium	Digestion, Inductively Coupled Plasma Method ^[2]
5	Chemical Oxygen Demand	Closed Reflux, Colorimetric Method ^[2]
6	Chromium	Digestion, Inductively Coupled Plasma Method ^[2]
7	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[2]
8	Copper	Digestion, Inductively Coupled Plasma Method ^[2]
9	Free Chlorine	Iodometric Method ^[2]
10	Hexavalent Chromium	Colorimetric Method ^[2]
11	Lead	Digestion, Inductively Coupled Plasma Method ^[2]
12	Manganese	Digestion, Inductively Coupled Plasma Method ^[2]
13	Nickel	Digestion, Inductively Coupled Plasma Method ^[2]
14	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ^[2]
15	pH	Electrometric Method ^[2]
16	Selenium	Digestion, Inductively Coupled Plasma Method ^[2]
17	Sulfide	Iodometric Method ^[2]
18	Temperature	Laboratory and Field Methods ^[2]
19	Total Dissolved Solids	Dried at 180 °C ^[2]
20	Total Kjeldahl Nitrogen	Macro-Kjeldahl Method ^[2]
21	Total Suspended Solids	Dried from 103 to 105 °C ^[2]
22	Trivalent Chromium	Calculation ^[2]
23	Zinc	Digestion, Inductively Coupled Plasma Method ^[2]

น้ำใต้ดิน จำนวน 13 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma Method ^[2]
2	Barium	Digestion, Inductively Coupled Plasma Method ^[2]
3	Cadmium	Digestion, Inductively Coupled Plasma Method ^[2]
4	Chromium	Digestion, Inductively Coupled Plasma Method ^[2]
5	Chromium (III)	Calculation ^[2]
6	Chromium (VI)	Colorimetric Method ^[2]
7	Copper	Digestion, Inductively Coupled Plasma Method ^[2]
8	Lead	Digestion, Inductively Coupled Plasma Method ^[2]
9	Manganese	Digestion, Inductively Coupled Plasma Method ^[2]
10	Nickel	Digestion, Inductively Coupled Plasma Method ^[2]
11	pH	Electrometric Method ^[2]
12	Selenium	Digestion, Inductively Coupled Plasma Method ^[2]
13	Zinc	Digestion, Inductively Coupled Plasma Method ^[2]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 9 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[3,4] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,4]
2	Barium	1) Digestion, Inductively Coupled Plasma Method ^[3,4] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,4]
3	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[3,4] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,4]
4	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[3,4] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,4]
5	Lead	1) Digestion, Inductively Coupled Plasma Method ^[3,4] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,4]

น้ำใต้ดิน...

6 Nickel...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
6	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(3,4) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,3,4)
7	pH	Electrometric Method ⁽²⁾
8	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(3,4) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,3,4)
9	Zinc	1) Digestion, Inductively Coupled Plasma Method ^(3,4) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,3,4)

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