

ภาคผนวก ณ

ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0617	22-Oct-24	22-Oct-25	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0108	27-Jan-25	27-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0111	21-Jan-25	21-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0113	27-Jan-25	27-Jan-26	12
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0632	16-Jan-25	16-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0877	3-Dec-24	3-Dec-25	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0879	13-Dec-24	13-Dec-25	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0876	9-Jan-25	9-Jan-26	12
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	17-Oct-24	17-Oct-25	12
Water Lab	Total Alkalinity	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Total Hardness	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Color	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Turbidity	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Dissolved Oxygen	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Dissolved Oxygen	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Nitrate	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Phosphate	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Sulfate	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Solids	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Solids	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	9-Apr-25	9-Apr-26	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0037	16-Aug-24	16-Aug-25	12
Water Lab	Conductivity	Conductivity meter	BKK_EN0373	26-Dec-24	26-Dec-25	12
Water Lab	Salinity	Conductivity meter	BKK_EN0373	26-Dec-24	26-Dec-25	12
Water Lab	BOD	DO Meter	BKK_EN0205	2-Feb-24	2-Aug-25	18
Water Lab	BOD	Incubator	BKK_EN0272	22-Aug-24	22-Aug-25	12
Water Lab	BOD	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	COD	Hot Block	BKK_EN0370	2-Jan-25	2-Jan-26	12
Water Lab	COD	Spectrophotometer	BKK_EN0018	13-Sep-24	13-Sep-25	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	29-Oct-24	29-Oct-25	12
Water Lab	Temperature	Digital Thermometer With Sensor	BKK_LG0060	3-Oct-24	3-Oct-25	12
Water Lab	Hexavalent Chromium	Spectrophotometer	BKK_EN0018	13-Sep-24	13-Sep-25	12
Water Lab	Iron	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Iron	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Iron	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Lead	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Lead	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Manganese	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Manganese	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Manganese	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Calcium	ICP-MS	BKK_EL0043	23-Sep-24	23-Mar-26	18
Water Lab	Calcium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Calcium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Magnesium	ICP-OES	BKK_EL0037	23-Sep-24	23-Mar-26	18
Water Lab	Magnesium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Magnesium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Copper	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Copper	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Copper	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Cadmium	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Cadmium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Cadmium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Zinc	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Zinc	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Zinc	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Nickel	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Nickel	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Nickel	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Selenium	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Selenium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Selenium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Barium	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Barium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Barium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Arsenic	ICP-MS	BKK_EL0043	8-Oct-24	3-Apr-26	18
Water Lab	Arsenic	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Arsenic	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Mercury	Mercury Analyzer	BKK_EL0128	6-Dec-24	6-Dec-25	12
Water Lab	Total Coliform	Autoclave	BKK_ML0043	26-Sep-24	26-Mar-26	18
Water Lab	Total Coliform	Incubator	BKK_ML0010	3-Dec-24	3-Dec-25	12
Water Lab	Total Coliform	Hot Air Oven	BKK_ML0013	23-Apr-24	23-Oct-25	18
Water Lab	Fecal Coliform	Autoclave	BKK_ML0043	26-Sep-24	26-Mar-26	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0010	3-Dec-24	3-Dec-25	12
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	23-Apr-24	23-Oct-25	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	4-Mar-25	4-Mar-26	12

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## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com



Cert. No. : ACC24056  
Pages : 1 of 3

### Calibration Certificate

**Equipment :** SOUND CALIBRATOR  
**Manufacturer :** RION  
**Model :** NC-74  
**Serial No.:** 34425566  
**ID No.:** BKK\_FS0617

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

**Received Date :** 04 OCTOBER 2024  
**Calibration Date :** 22 OCTOBER 2024  
**Date of Issue :** 24 OCTOBER 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

*T. Petchur*  
( Thanakul Petchur )

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

## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com



Cert. No. : ACC24056  
Job No. : VC67AC0170  
Pages : 2 of 3

**Calibration Procedure :** CP-AC-03

#### Calibration Method :

This equipment was calibrated by follow on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

#### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL.BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL.BP 20/0267	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL.BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V744B6069	EF-0009-24	09-FEB-25

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

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

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

*T. Petchur*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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Cert. No. : ACC24056  
Job No. : VC67AC0170  
Pages : 3 of 3

**Result of calibration :**

**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.14	0.14	0.14	0.40

**2. Frequency**

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.9	0.2	0.1	1.0

**3. Total distortion**

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.12	0.10	3.0

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

End of Calibration Certificate

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Cert. No. : ACL25092  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00858518 / 175176 / 85721  
ID No. : BKK\_FS0108

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 23.0  $\pm$  3 ) °C  
Pressure : ( 101.3  $\pm$  3 ) kPa  
Relative Humidity : ( 50.0  $\pm$  20 ) %  
Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

REVIEW BY *Nathakorn P.*  
APPROVED BY *T. Petchur*  
NEXT CAL DATE : 27/01/26

Calibrated by : Nathakorn Pisutpaisan

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

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Calibration Procedure : CP-AC-01

Cert. No. : ACL25092  
Job No. : VC68AC0063  
Pages : 2 of 8

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	3977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Job No. : VC68AC0063  
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**Summary of Measurement Result :**

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

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**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

**2. Self-generated noise****2.1 Normal test**

Measured Value ( dB )
14.8

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

Frequency Weighting	Weighting ( dB )
A - weight	11.6
C - weight	17.9
Flat	23.9

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	2.3	2.3	2.3	±5.0

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**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	-0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz****5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

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**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	28.8	-0.2	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

## 11. Overload indication

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

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

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Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00858521 / 158765 / S0767  
ID No.: BKK\_FS0111

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

REVIEW BY ..... *Nathan P.*  
APPROVED BY ..... *T. Petchur*  
NEXT CAL DATE ..... 21/01/26

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

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

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchur

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 3 of 8

## Summary of Measurement Result :

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

T. Petchur

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Page : 4 of 8

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

**2. Self-generated noise****2.1 Normal test**

Measured Value ( dB )
14.2

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

Frequency Weighting	Weighting ( dB )
A - weight	10.8
C - weight	17.4
Flat	23.0

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.6	0.6	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.9	-1.9	-1.9	±5.0

*T. Petch*

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz****5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

*T. Petch*

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

*T. Petch*

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	29.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

*T. Petch*

Cert. No. : ACL25066  
Job No. : VC68AC0058  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lepeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

## 11. Overload indication

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

## 12. High level stability

Frequency	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Weighting	( dB )	( dB )	( dB )	( dB )
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

T. Petchuraj

Cert. No. : ACL25094  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00858523 / 170666 / 73129  
ID No.: BKK\_FS0113

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

REVIEW BY : *Number 9*  
APPROVED BY : *[Signature]*  
NEXT CAL DATE : 27/01/26

Calibrated by : Nathakorn Pisutpaisan

Approved by : *T. Petchuraj*  
( Thanakul Petchuraj )

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

Cert. No. : ACL25094  
Job No. : VC68AC0063  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference  
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchuraj

Cert. No. : ACL25094  
Job No. : VC68AC0063  
Pages : 3 of 8

## Summary of Measurement Result :

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

T. Petchuraj



Cert. No. : ACL25094  
Job No. : VC68AC0063  
Page : 4 of 8

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

**2. Self-generated noise****2.1 Normal test**

Measured Value ( dB )
14.2

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

Frequency Weighting	Weighting ( dB )
A - weight	11.2
C - weight	17.4
Flat	23.0

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-0.2	-0.2	-0.2	±5.0

Cert. No. : ACL25094  
Job No. : VC68AC0063  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz****5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

Cert. No. : ACL25094  
Job No. : VC68AC0063  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL25094  
Job No. : VC68AC0063  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	28.9	-0.1	±1.1

**9. Tone burst response**

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



Cert. No. : ACI.25094  
Job No. : VC68AC0063  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

## 11. Overload indication

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

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

T. R. K.



## Certificate of Calibration

## Customer

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

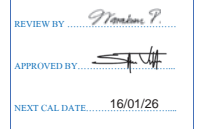
Certificate No : 25-ACT-009

Request No : Req-2025-0090

## Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1  
Manufacturer : RION Range : 94 dB / 1000 Hz  
Model : NC-74 Instrument Status : Used  
Serial Number : 34178119  
ID : BKK\_FS0632

## Calibration Environment and Details

Temperature : ( 23 ±2 °C )  
Humidity : ( 50 ± 20 %RH )  
Barometric Pressure : ( 1013 ±10.0 hPa )  
Received Date : 15 January 2025  
Calibration Date : 16 January 2025  
Location of Calibration : LAB 1 Acoustic  
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

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

## Note

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

Calibrated By : Mr. Noppadon Luangart  
Service Calibration EngineerApproved By : Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 16 January 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.

FM-708-ACT-02 Rev.03 Issue date 5/6/24

Certificate No : 25-ACT-009  
Request No : Req-2025-0090

## Sound pressure level

## Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty ( ± dB )	Acceptance limit Class 1 ( ± dB )	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.82	-0.18	-	-	0.13	0.25	Pass

## Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty ( ± % )	Acceptance limit Class 1 ( ± % )	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty ( ± % )	Acceptance limit Class 1 ( ± % )	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.71	-	0.40	2.5	Pass

## Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

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

FM-708-ACT-02 Rev.03 Issue date 5/6/24

Certificate No : 25-ACT-009  
Request No : Req-2025-0090

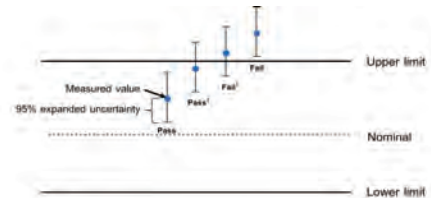
## Decision Rule for Statements of Conformity

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

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

Pass<sup>1</sup> = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.Fail<sup>1</sup> = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Calibration

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

FM-708-ACT-02 Rev.03 Issue date 5/6/24

Cert. No. : ACL24379  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00572552 / 170384 / 72890  
**ID No.:** BKK\_FS0877

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SIAM LUANG,  
BANGKOK, 10250 THAILAND.

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

**Received Date :** 15 NOVEMBER 2024  
**Calibration Date :** 03-04 DECEMBER 2024  
**Date of Issue :** 04 DECEMBER 2024

REVIEW BY *Thana P.*  
APPROVED BY *Thanakul P.*  
NEXT CAL DATE... 03/12/25

**Calibrated by :** Tanadej Chaimongkol

**Approved by :**

*Thanakul P.*  
( Thanakul Petchurai )

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

Cert. No. : ACL24379  
Job No. : VC68AC0032  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL24379  
Job No. : VC68AC0032  
Pages : 3 of 8**Summary of Measurement Result :**

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

Cert. No. : ACL24379  
Job No. : VC68AC0032  
Page : 4 of 8**Result of calibration :**

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
14.2

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

Frequency Weighting ( dB )	Weighting ( dB )
A - weight	10.8
C - weight	17.4
Flat	23.2

## 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.2	-1.1	-1.1	± 5.0

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Job No. : VC68AC0032  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.1	0.1	± 0.3

*T. Petch.*

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Job No. : VC68AC0032  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

*T. Petch.*

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Job No. : VC68AC0032  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	29.0	0.0	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

*T. Petch.*

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Job No. : VC68AC0032  
Pages : 8 of 8

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	132.9	-0.1	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

**11. Overload indication**

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

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.1	137.1	0.0	±0.3

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

End of Calibration Certificate

*T. Petch.*



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Cert. No. : ACL24403  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00572563 / 170399 / 72900  
**ID No.:** BKK\_FS0879

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

**Received Date :** 06 DECEMBER 2024  
**Calibration Date :** 13-16 DECEMBER 2024  
**Date of Issue :** 16 DECEMBER 2024

REVIEW BY *Namkorn P.*  
APPROVED BY *T. Petch.*  
NEXT CAL DATE. 13/12/25

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

*T. Petch.*  
( Thanakul Petchurai )

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

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Cert. No. : ACL24403  
Job No. : VC68AC0045  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

### Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL.BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL.BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL.BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24403  
Job No. : VC68AC0045  
Pages : 3 of 8

### Summary of Measurement Result :

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

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Cert. No. : ACL24403  
Job No. : VC68AC0045  
Page : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value ( dB )
13.8

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

Frequency Weighting ( dB )	Weighting ( dB )
A - weight	9.9
C - weight	16.4
Flat	22.1

#### 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	-0.9	-0.8	-0.7	±5.0



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Job No. : VC68AC0045  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

**5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

*T. Petch*

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Job No. : VC68AC0045  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

*T. Petch*

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Job No. : VC68AC0045  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	29.1	0.1	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

45/-45/1 Sirinthorn Road, Bangbunmu, Bangplud, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

**SITHIPORN**  
associates



Cert. No. : ACL24403  
Job No. : VC68AC0045  
Pages : 8 of 8

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

**11. Overload indication**

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

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

*T. Petch*

*T. Petch*

Cert. No. : ACL25008  
Pages : 1 of 8

## Calibration Certificate


Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00572551 / 158776 / 58777  
ID No.: BKK\_FS0876

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 19 DECEMBER 2024  
Calibration Date : 09 - 10 JANUARY 2025  
Date of Issue : 13 JANUARY 2025

REVIEW BY APPROVED BY 

NEXT CAL DATE 09/01/26

Calibrated by : Nathakorn Pisutpaisan

Approved by :

  
( Thanakul Petchurai )

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

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 3 of 8

## Summary of Measurement Result :

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

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Page : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.94)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Nominal test

Measured Value ( dB )
16.8

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

Frequency Weighting	Weighting ( dB )
A - weight	11.6
C - weight	17.7
Flat	23.5

## 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	2.4	2.5	2.5	±5.0



Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighing response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

T. Petch

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.1	0.1	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

T. Petch

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 7 of 8

## 8. Level linearity including the level range control

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

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

T. Petch

Cert. No. : ACL25008  
Job No. : VC68AC0052  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.5	89.4	-0.1	±1.5

## 12. High level stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

T. Petch





## Certificate of Calibration

Cert.No.: 24CH1295  
Page.: 1 of 3

Equipment : pH Meter  
Manufacturer : Hach  
Model : HQ411d  
Serial No. : 200100031163  
ID No. : BKK\_EN0342  
Condition As-Received: Used Item  
Received Date : 16 October 2024  
Calibration Date : 17 October 2024  
Reference : 2410-0548DSC-5  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure :  
In - house method :  
- CP-CH5 by direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by :

- ( ) Unnopphol Harachai  
( ) Ponpan Paipim  
(✓) Salthip Meangmai

Issue Date : 21 October 2024

The Uncertainties are for a confidence probability of approximately 95%

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



## Certificate of Calibration

Cert.No.: 24CG952  
Page.: 1 of 2

Equipment : Burette  
Capacity : 50 mL  
Serial No. :  
ID No. : BKK\_EN0171  
Manufacturer : Witeg  
Made in : Germany  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Ambient Temperature : (20 ± 2.5) °C  
Relative Humidity : (50 ± 10) %  
Barometric Pressure : 760 mmHg  
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Natcha Chayingcheiw

Approved by :

- ( ) Unnopphol Harachai  
(✓) Srisuda Khamtha  
( ) Sa-ngeunkam Wongsa

Issue Date : 27 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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

### Calibration Results

Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PHC281

- Serial No. : 230473042902

Dimension of probe

- Length : 103 mm.

- Diameter : 12 mm.

- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00

Remark : UUC\* = Unit Under Calibration

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

-oOo-





Equipment : Burette  
Received Date : 23 February 2024  
Condition As-Received : New Item  
Calibration Date : 27 February 2024  
Reference : 2402-0757DSC-1

Cert.No.: 24CG952  
Page.: 2 of 2

#### Condition of this result of calibration

##### 1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205DR	1126143764	140RC004	23MM538	TPA	15 Sep 2024
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	23H1275	TPA	09 June 2024
3) Thermometer	-	0834181	140EC005	23I948	TPA	10 Aug 2024

This certification is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

#### Calibration result :

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( ± mL )	k Factor
50	50.0032	0.010	2.00

Remark mL = cm<sup>3</sup>

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 %.

-o-o-



## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T232160

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.


104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory

Date of Receipt : 29 November 2023

Calibrated By : Atiphong Rongrat ( Technician )

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 09 JAN 2024

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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L15 118/18-08-66



## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T232160

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Cooling Room )

Date of Calibration : 6 December 2023

Environment : Temperature : 23.4-24.9 °C

Line Voltage : 221.4-230.2 V

Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986 ).

All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

##### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 April 2024

##### 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 )

##### 4. Condition of calibrated item : good

##### Equipment Description :

Time Constant 1 Hour 30 Minute At 3 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max

☐ Close

☒ Not Available

##### 5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By : 

FM-L15 118/18-08-66



## Metrology

SCI ECO Services Company Limited

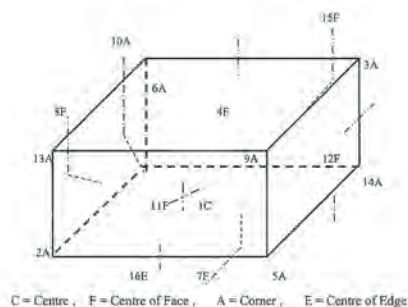
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T232160

Page 3 of 4

## Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C = TN161	12F = TN172
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4E = TN164	15F = TN175
5A = TN165	16E = TN176
6A = TN166	
7E = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By : 

FM-L15 118/18-08-66



Certificate No. T232160

Page 4 of 4

## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170	TN171	TN172
3.0	2.83	3.34	2.95	3.46	3.45	3.76	3.25	3.46	3.39	3.50	3.58	3.42
	TN173	TN174	TN175	TN176								
	3.33	3.39	3.15	3.43								

Chamber ( Cooling Room )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min	Max					
3.0	2.8	4.1	3.36	1.10	2.00	1.50	2.09

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

*[Signature]*

FM-L15/18/18-08-66



Certificate No. T250873

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber (Cooling Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

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

Customer Location : Laboratory Room

Date of Receipt : 28 May 2025

Calibrated By : Atiphong Rongrat (Technician)

Approved By : *[Signature]* / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 19 JUN 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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-TL06/102/27-03-68



Certificate No. T250873

Page 2 of 4

## Calibration Report

Equipment : Chamber (Cooling Room)

Date of Calibration : 4 June 2025

Environment : Temperature : 23.4-24.9 °C

Line Voltage : 221.4-230.2 V

Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E1145-94 (Reapproved 2001) and AS2853-1986).

All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025

### 3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

### 4. Condition of calibrated item : good

#### Equipment Description :

Time Constant : 2 Hour 20 Minute At 3 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max

☐ Close

☒ Not Available

### 5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By:

*[Signature]*

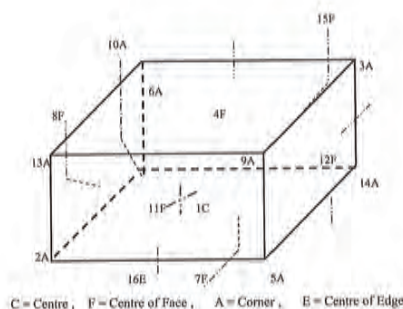
FM-TL07/102/27-03-68



Certificate No. T250873

Page 3 of 4

## Calibration Report



1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106
6A = TN96	
7F = TN97	
8F = TN98	
9A = TN99	
10A = TN100	
11F = TN101	

Approved By:

*[Signature]*

FM-TL07/102/27-03-68





Certificate No. T250873

Page 4 of 4

## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)										
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.14	2.98	3.44
	TN103	TN104	TN105	TN106							
	3.19	3.06	3.46	2.92							

Setting (°C)	Reading (°C)		Temperature Distribution					Coverage Factor k
	Min	Max	Average	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)		
3.0	2.8	3.9	3.4	3.14	1.20	1.30	1.90	2.04

The calibration result apply only the above calibrated item.  
The result of test was found accurate as shown on date and place of test only.  
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

PM-FL07 02/27-03-68

REVIEW BY:   
APPROVED BY:   
NEXT CAL DATE: 21 Nov 25



## Certificate of Calibration

Shimadzu LC-HIC

This certificate is to verify that instrument below are calibrated

by Bara Scientific Co., Ltd

Instrument	Serial No.
DGU-403	L22166050657
SIL-20AC	L20176012374
CTO-40S	L22236003442
LC-20ADSP	L20106096217
SPD-40	L22256002616
CDD-10Avp	C21346004484
CBM-40lite	L22126103139

For

ALS Laboratory Group (Thailand) Co., Ltd.

Operator Signature: Date: 21 November 2024

(Mr.Thawatchai Toros)

Service Engineer



Bara Scientific Co., Ltd  
11 Cha Liang Building Floor 7, 368 Rama 4 Road Siam Rekrut Bangkok 10500  
Thailand Tel: 02-6174360 (Auto 10 lines) Fax: 02-6372466 E-mail: barascientific@gmail.com

PM-FL07 3 Dec 2023

PM-SS-13 Rev 00

Sartorius (Thailand) Co., Ltd.  
120 Rama 9 Road, Huaykong, Huaykong, Bangkok 10250  
Tel: +66 2843 8301-6, e-mail: service.thailand@sartorius.com



REVIEW BY:   
APPROVED BY:   
NEXT CAL DATE: 02/08/25

## Certificate of Calibration

Model Number: MSE2245-100-DU Certificate No.: 24BC0270  
Description: Analytical Balance Issued Date: Monday, August 05, 2024  
Serial Number: 0027405555 Reference No.: 240942  
ID No.: BXC\_EN0003  
Manufacturer: Sartorius Page No.: 1 of 2

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

Calibrated Place: Lab Room

Calibrated By: Mr. Chuchit Inthana  
Calibration Date: Friday, August 02, 2024

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

### Metrological data:

Capacity: 220 g Repeatability: 0.0001 g  
Ambient Conditions: Temperature: 23.0 °C ± 5.0 °C  
Humidity: 55.0 % RH ± 10.0 % RH  
Pressure:   
Equipment Condition: ☒ Good Operate ☐ Bad

Reasons for calibration: ☒ New installation ☐ Service / Repair ☐ Recalibration / Maintenance

Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

### Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YC5011-522-00	Sartorius weight set 1mg - 5000g 12/YS011-522-00	YES	M23081975	23-Aug-2026
Testo 174 H	Thermo-Hygrometer, Testo 174H	ENTECH	HT 661303/H861140	12-Nov-2024

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

Mr. Chuchit Inthana (Technical Manager)



SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.

120 Rama 9 Road, Huaykong, Huaykong, Bangkok 10250  
Tel: +66 2843 8301-6 Fax: +66 2843 8397 e-mail: service.thailand@sartorius.com

SARTORIUS

## Certificate of Calibration

Model Number: MSE2245-100-DU Certificate No.: 24BC0270  
Description: Analytical Balance Issued Date: Monday, August 05, 2024  
Serial Number: 0027405555 Reference No.: 240942  
ID No.: BXC\_EN0003  
Manufacturer: Sartorius Page No.: 2 of 2

### Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The repeatability is the ability of a weighing instrument to display nearly identical results under identical test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability results.	The off-center loading error is caused by the difference between the result of the load at 10 g or 100 g (maximum capacity) placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).
Nominal Value: (Low Load) 20 g Tolerance: 0.0001 g	Nominal value: 100 g Tolerance: 0.0004 g
Nominal Value: (High Load) 200 g Tolerance: 0.0001 g	Difference: 1 0.0000 2 0.0000 3 0.0000 4 0.0000 5 0.0001 6 -
Standard Deviation: 0.00004 g, 0.00006 g	

### Linearity

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

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00015
0.1	0.1000	0.1000	0.0000	0.00015
1	1.0000	1.0000	0.0000	0.00015
2	2.0000	2.0000	0.0000	0.00015
5	5.0000	5.0000	0.0000	0.00015
10	10.0000	10.0000	0.0000	0.00015
20	20.0000	20.0000	0.0000	0.00015
50	50.0000	50.0001	0.0001	0.00016
100	100.0000	100.0001	0.0001	0.00019
200	200.0000	200.0005	0.0005	0.00029

End of Report

SOP FM 33 03 February 2022





## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.  
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100  
Bangkok Tel : +668 9205 6851 , +669 8247 2360  
Website : www.scieco.co.th E-Mail : calibrate@scg.com




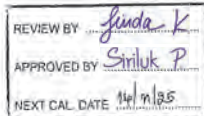
NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T240904

Page 1 of 3

### Certificate of Calibration

Equipment : Chamber ( Oven )  
Manufacturer : Memmert  
Model : UF 450  
Serial No. : B717.0531  
Customer Code : BKK\_EN0273  
ID No. : T8042A4  
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250  
Customer Location : Laboratory (Oven Room)  
Date of Receipt : 08 May 2024  
Calibrated By : Preecha Phisassuthikul ( Temperature Calibration Manager )  
Approved By :  / Nuafun Sungsom (Metrology Manager)  
Date of Issue : 23 MAY 2024



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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L14 11/18-08-66



## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T240904

Page 2 of 3

### Calibration Report

Equipment : Chamber ( Oven )  
Date of Calibration : 14 May 2024  
Environment : Temperature : 26.5-28.1 °C  
Line Voltage : 226.7-229.8 V  
Relative Humidity : 51 - 57 %RH

#### Condition of this results of calibration :

- This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ) . All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	21-(CH1-10)	T231955	17 November 2024
DATA LOGGER	54970A	T121	T231955	17 November 2024
- This certificate is traceable to : National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TIS-TIS 17025 CALIBRATION 0244.)
- Condition of calibrated item : good  
Equipment Description :

Time Constant	1	Hour	30	Minute	At	104 °C
Fresh Air Damper	<input type="checkbox"/> Open	<input type="checkbox"/> Min	<input type="checkbox"/> Medium	<input type="checkbox"/> Max		
	<input type="checkbox"/> Close					
	<input checked="" type="checkbox"/> Not Available					
- Adjustment :  
( X ) without adjustment ( ) after adjustment

Approved By 

FM-L15 11/18-08-66



## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.

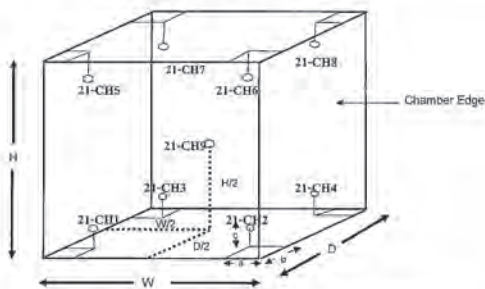


NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T240904

Page 3 of 3

### Calibration Report



Remark :  
Internal Dimensions of Chamber : W (Width) = 104 cm , H (Height) = 72 cm and D (Depth) = 60 cm .  
Size of Installed Standard sensor number 21-CH1 to number 21-CH8 : a = 5 cm , b = 5 cm and c = 5 cm .  
Size of Installed Standard sensor number 21-CH9 : W/2 = 104 cm/2 , H/2 = 72 cm/2 and D/2 = 60 cm/2

#### Measurement Results

Average Standard Reading at each position ( °C )								
Calibration Point	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8
104	103.4	105.0	102.7	103.6	103.3	104.6	106.3	104.0
180	179.5	181.1	179.2	179.5	179.0	181.3	179.3	179.9

Chamber ( Oven )			Temperature Distribution				
Setting ( °C )	Reading ( °C )		Average ( °C )	Stability ( °C )	Uniformity ( °C )	Uncertainty ( °C )	Coverage Factor k
	Min , Max	Average					
104.0	103.9 , 104	104.0	103.85	0.14	1.27	0.84	2.00
180.0	179.9 , 180.1	180.0	179.94	0.39	2.29	0.76	2.00

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate

Approved By 

FM-L15 11/18-08-66



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110


Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

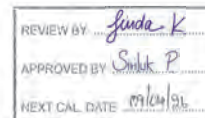
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250578

Page 1 of 4

### Certificate of Calibration

Equipment : Digestion Unit  
Manufacturer : SCP Science  
Model : DigiPRER IIT  
Serial No. : HTC1120480658  
Customer Code : BKK\_EN0366  
ID No. : T2635A5  
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250  
Customer Location : Wet Chemistry Lab I  
Date of Receipt : 2 April 2025  
Calibrated By : Atiphong Rongrat ( Technician )  
Approved By :  / Boonchai Suriyawong ( Site Calibration Manager )  
Date of Issue : 13 MAY 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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L12 10/20-05-51





Certificate No. T250578

Page 2 of 4

## Calibration Report

Equipment : Digestion Unit  
Date of Calibration : 9 April 2025  
Environment : Temperature : 23.9 - 26.3 °C  
Line Voltage : 221.8 - 225.9 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouples type S into its chamber, the other one thermocouple type T use for ambient temperature measurement. The calibration was done in according to WI-T10.  
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.
2. Reference Standard Instrument
- | Instrument  | Model  | Instrument No. | Certificate No. | Due Date         |
|-------------|--------|----------------|-----------------|------------------|
| TC          | Type S | M7-(C11)-C114  | T242035         | 04 December 2025 |
| DATA LOGGER | 34970A | T121           | T242035         | 04 December 2025 |
3. This certificate is traceable to :  
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 024.)
4. Condition of calibrated item : good
- Equipment Description :  
Time Constant : 2 Hour 40 Minute At 380 °C  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available
5. Adjustment :  
( X ) without adjustment ( ) after adjustment

Approved By:

FM-L13 108/30-05-S7



Certificate No. T250578

Page 3 of 4

## Calibration Report



FRONT

### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M7-C11-Block 1	M7-C11-Block 2	M7-C11-Block 3	M7-C11-Block 4	M7-C11-Block 5	M7-C11-Block 6	M7-C11-Block 7	M7-C11-Block 8
380.0	380.0	379.8 - 380.2	Max °C	380.0	381.0	380.9	379.5	380.3	380.9	381.3	380.1
			Min °C	379.6	380.8	380.6	379.3	379.9	380.5	380.9	379.6
			Average °C	379.8	380.9	380.7	379.5	380.4	380.7	381.1	379.9
			Stability ± °C	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M7-C11-Block 9	M7-C11-Block 10	M7-C11-Block 11	M7-C11-Block 12	M7-C11-Block 13	M7-C11-Block 14	M7-C11-Block 15	M7-C11-Block 16
380.0	380.0	379.8 - 380.2	Max °C	378.9	378.7	379.8	381.0	382.8	381.3	381.7	380.4
			Min °C	378.3	378.2	379.3	380.7	382.1	380.5	381.3	380.0
			Average °C	378.6	378.5	379.5	380.9	382.4	380.9	381.5	380.2
			Stability ± °C	0.3	0.2	0.1	0.1	0.3	0.4	0.2	0.2

Approved By:

FM-L13 108/30-05-S7



Certificate No. T250578

Page 4 of 4

## Calibration Report

### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M7-C11-Block 17	M7-C11-Block 18	M7-C11-Block 19	M7-C11-Block 20	M7-C11-Block 21	M7-C11-Block 22	M7-C11-Block 23	M7-C11-Block 24
380.0	380.0	379.8 - 380.2	Max °C	379.3	379.2	379.1	379.3	380.8	381.1	382.5	381.3
			Min °C	379.1	379.0	378.8	379.2	380.3	380.8	382.1	381.1
			Average °C	379.2	379.1	378.9	379.3	380.6	380.9	382.3	381.2
			Stability ± °C	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M7-C11-Block 25	M7-C11-Block 26	M7-C11-Block 27	M7-C11-Block 28	M7-C11-Block 29	M7-C11-Block 30	M7-C11-Block 31	M7-C11-Block 32
380.0	380.0	379.8 - 380.2	Max °C	378.5	378.2	377.5	378.5	380.4	380.8	380.4	380.0
			Min °C	378.2	377.9	378.3	378.2	380.0	380.5	380.1	380.6
			Average °C	378.3	378.0	377.9	378.3	380.2	380.7	380.2	380.8
			Stability ± °C	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M7-C11-Block 33	M7-C11-Block 34	M7-C11-Block 35	M7-C11-Block 36	M7-C11-Block 37	M7-C11-Block 38	M7-C11-Block 39	M7-C11-Block 40
380.0	380.0	379.8 - 380.2	Max °C	379.9	380.0	379.8	379.7	380.1	380.2	379.7	379.0
			Min °C	379.6	379.6	379.3	379.3	379.8	379.9	379.4	379.5
			Average °C	379.8	379.8	379.7	379.5	379.9	380.1	379.5	379.7
			Stability ± °C	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1

The expanded uncertainty of temperature measurement was  $\pm 2.36^{\circ}\text{C}$

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-L13 108/30-05-S7



บริษัท ดับเบิล เอส ไดแอกโนสติกส์ จำกัด  
DOUBLE S DIAGNOSTICS CO., LTD.

4 ซอยสุขุมวิท 12 (ซอยสุขุมวิท) กรุงเทพมหานคร 10110 โทรศัพท์: (02) 547-2000 โทรสาร: (02) 747-2000  
4 Soi Sukhumvit 12, Bangkok, Thailand 10110 Tel: (02) 547-2000 Fax: (02) 747-2000

Maintenance Plan YEAR : 2024

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TSU												

### Periodical maintenance check list for Konelab

	6M	12M	Note
1.Diluent-wash tubing change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.ISE tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	None
3.Syringe check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4.Dispensing check/ change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5.Waste tubing change when necessary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6.Lamp check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7.Mixer paddle/paddle change(not Konelab20)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8.ISE needles check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None
9.Pump tubing check/ change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10.Broken/worn out part check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
11.Peristaltic pump check/cleaning/ lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.Heating check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
13.Cooling check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
14.Dispenser mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15.Cuvette transfer mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
16.Dispenser movement check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
17.Sample/reagent register check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
18.Dispensing tubing tightness check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
19.Photometer and optics cleaning/check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
20.Workstation PC cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
21.Mechanic cleaning/lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22.Instrument cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23.Complete analyzer testing with waterblank/QC or sample	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24.Test parameters/Adjustment/config. Save to USB key	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25.UPS Test	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Place: ALS LAB Instrument: Bio Assay  
Date/Time: 16/8/25 Serial no: 82281  
Service done by: B. P. S. Install date: 16/8/25  
Signature of customer: 05/01/25 Date/Time: 16/8/25

Laboratory  
Analyzer User

8/16/2024 14:53

Performed      8/16/2024  
Lot      M334

ACCEPTANCE CRITERIA

	Result	Limit	Warning
Temperature (°C)	37.8	37.0 +/- 1.0	
Dispensing ratio	16.4	14.8 -- 17.2	
CV%	0.29	<1.7	
Photometric noise			
Max SD L340_2 (mA)	0.17	<2.0	
Max SD L340_4 (mA)	0.87	<3.0	
Linearity of photometer			
Slope	1.0141	0.94 - 1.06	
Curvature	0.0053	+/- 0.02	
Max bias from linear fit (mA)	4.3	<15.0	
Max delta %	-1.6	+/- 6.0	
Linearity of sample dispensing			
Proport. volume XDISP2 (μl)	2.06	1.96 - 2.16	
Proport. volume XDISP4 (μl)	4.14	3.86 - 4.40	
XDISP2 CV%	1.21	<2.0	
XDISP4 CV%	0.90	<2.0	
XDISP10 CV%	0.68	<2.0	
Needle 0 μl volume			
Average (A)	0.005	<0.050	
Standard deviation (A)	0.002	<0.005	
Volume (μl)	0.03	<0.32	

OTHER INFORMATION

Dispensing ratio	Photom. noise: SD (mA)
Posit: Result (A)	Posit: L340_2      L340_4
1      0.1549	1      0.15      0.80
2      0.1549	2      0.17      0.79
3      0.1537	3      0.64      0.65
4      0.1547	4      0.16      0.31
5      0.1547	5      0.11      0.58
6      0.1545	6      0.14      0.87

Laboratory  
Analyzer User

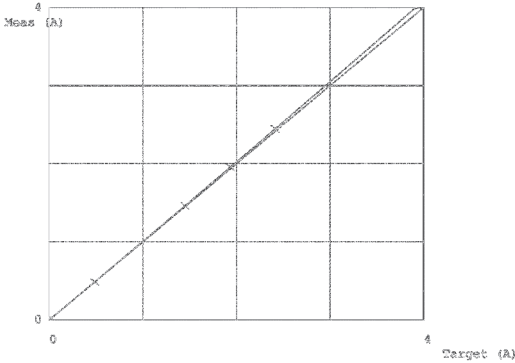
8/16/2024 14:53

Linearity of sample dispensing

Test	Absorbance (A)
XDISP2	0.306
XDISP4	0.612
XDISP10	1.471

Linearity of photometer

L340_	Target (A)	Meas (A)	Delta (A)	Delta %
1	0.002	0.006	-0.004	-217.7
2	0.486	0.493	-0.007	-1.5
3	1.451	1.469	-0.018	-1.2
4	1.936	1.963	-0.027	-1.4
5	2.415	2.454	-0.039	-1.6



Certificate of Calibration

Equipment: pH METER      Certificate No.: C07240635  
Model: TitroLine 7000      Issued Date: 26 December 2024  
Serial No. (or ID.): 10013826      Job No.: WO-00055577  
Manufacturer: SI Analytics      Page: 1 of 3  
Electrode Serial No.: BW1-13563      Model: 8157BNUMD      Brand: Thermo Scientific  
Condition: In Condition

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 20.8 °C ± 0.1 °C      26/12/2025  
Humidity 62.8 %RH ± 0.5 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr.Pongpisut Suebchantha  
Calibration Date: 26 December 2024  
The Method used: In house method, CAL-WI-58, base on ASTM E 70-07  
Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 980701, 980704, 980707 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20240267EA

(Mr. Pongpisut Suebchantha)

(Miss Kaewkan Suradech)

Person in charge      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 the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items issued, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Certificate No.: C07240635      Page 2 of 3

Calibration Results:

pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
(mV)	(mV)	Error (mV)	(pH)		
414.12	413.8	-0.32	0.004	0.065	2.00
354.96	354.7	-0.26	1.003	0.065	2.00
295.8	295.6	-0.20	2.001	0.065	2.00
236.64	236.4	-0.24	3.003	0.065	2.00
177.48	177.3	-0.18	4.002	0.065	2.00
118.32	118.3	-0.02	5.002	0.065	2.00
59.16	59.1	-0.06	6.003	0.065	2.00
0	0.1	0.10	7.000	0.065	2.00
-59.16	-59.1	0.08	8.000	0.065	2.00
-118.32	-118.2	0.12	9.000	0.065	2.00
-177.48	-177.3	0.18	10.002	0.065	2.00
-236.64	-236.6	0.04	11.001	0.065	2.00
-295.8	-295.6	0.20	12.001	0.065	2.00
-354.96	-354.6	0.36	13.001	0.065	2.00
-414.12	-413.9	0.22	14.002	0.065	2.00



Certificate No.: C07240635 Page 3 of 3

#### Practical slope and zero point\*

The three-point calibration using three standard buffer solutions: pH 4.008, pH 6.986 and pH 9.997  
- During calibration, display of pH meter can be adjust to reading: pH 4.008, pH 6.986 and pH 9.997  
The practical slope of the pH electrode; 58.55 (mV/pH), 98.97%  
The zero point of the pH electrode; 6.55 (pH)

#### Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.024	0.016	0.0070	2.03
6.986	6.989	0.003	0.0093	2.00
9.997	10.002	0.005	0.013	2.00

\* Calibration Marked "Not TISI Accredited" in this Certificate have been included for completeness.

The End of Certificate

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DKSH Technology Limited  
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C07-14: 9 Apr 2024



#### ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00055577

ชนิดเครื่องมือ: pH METER

รุ่น: TitroLine 7000

หมายเลขเครื่อง: 10013826

ตรวจสอบ (รับ)		ตรวจสอบ (ส่ง)		หมายเหตุ
26 Dec 2024	รายการตรวจเช็ค	26 Dec 2024		
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ	
<b>General</b>				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในนอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Spectrophotometer</b>				
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	7. ส่วนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	11. ซอฟต์แวร์หลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>
<b>pH Meter and Conductivity Meter</b>				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Turbidimeter</b>				
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	17. จะมีการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>
<b>Automatic titrator</b>				
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>

เพื่อเติมข้อมูลแนะนำ :

Mr.Pongpisut Suebchantha  
Service Engineer

บริษัท ดีเคเอสเอ เอเชีย (ไทย) จำกัด  
DKSH Technology Limited  
2533 ซอยพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10260  
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CAL-FM-R31-03: 26 Jul 2022



#### Certificate of Calibration

Equipment : Digital Thermometer with Probe  
Model : TitroLine 7000  
Serial No. : 10013826  
Manufacturer : SI Analytics  
ID No. : -

Certificate No. : C15241274  
Issued Date : 26 December 2024  
Job No. : WO-00055577  
Page : 1 of 2  
Condition : In Condition

Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition : Temperature: 30 °C ± 10 °C  
Humidity: 55 %RH ± 25 %RH  
Voltage: 220 VAC ± 10 %

Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd., ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech

Calibration Date : 26 December 2024

The Method used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by:  
Quality Reborn Co.,Ltd. (QR)

(Miss Kaewkan Suradech)

Person in charge

(Mr. Tweewong Thaitiang)

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 the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C15-14: 06 Dec 2022



Certificate No.: C15241274

Page: 2 of 2

#### Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-3149	26 November 2024	26 November 2025

#### Calibration Results:

##### Without Adjustment

Sensor Type: RTD		Electrode Serial No.: BW1-13563		Channel: -	
Diameter (mm): 12		Length (mm): 120		Immersion (mm): 120	
Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)	
25.0	24.904	24.9	0.004	0.20	

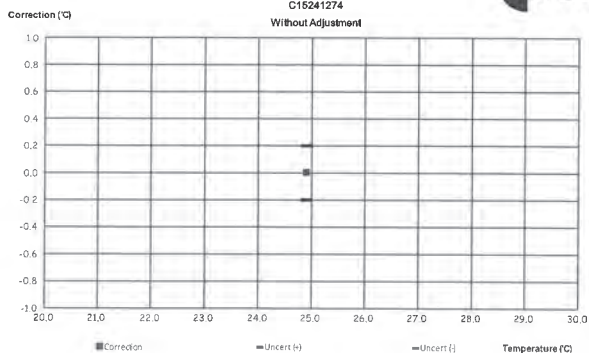
The End of Certificate

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## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

Equipment : Digital Thermometer with Probe

Certificate No. : C15241274

Serial No. : 10013826

Model : TiltroLine 7000

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
26-Dec-2024			26-Dec-2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor ( In / Ex )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ : \_\_\_\_\_

Ms. Kaewkan Suradech  
Service Engineer

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DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phra Khanong, Bangkok 10260  
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## Certificate of Calibration

Equipment: CONDUCTIVITY METER  
Model: ORION STAR A215  
Serial No. (or ID): X58031  
Manufacturer: Thermo Scientific  
Electrode Serial No.: YV1-18416  
Condition: In Condition

Certificate No.: C24240300  
Issued Date: 26 December 2024  
Job No.: WO-00055577  
Page: 1 of 2  
Model: ORION 013005MD  
Brand: Thermo Scientific

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

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

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Pongpisut Suebchantha  
Calibration Date: 26 December 2024  
The Method used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14  
Traceability: This certificate is traceable to the SI units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 990789, 990790, 990791

(Mr. Pongpisut Suebchantha)  
Person in charge

(Miss Kaewkan Suradech)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.  
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2533 Sukhumvit Road, Bangkok, Phra Khanong, Bangkok 10260  
Phone : +66 2639 7000 Email : info.calibration@dksh.com Website : www.dksh.com/scientific-thailand

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CAL-FM-C24-09: 12 Sep 2022



Certificate No.: C24240300

Page: 2 of 2

### Calibration Results:

#### Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
84.003 µS/cm	94.79 µS/cm	-10.787 µS/cm	2.00	0.58 µS/cm
1413.1 µS/cm	1427 µS/cm	-13.9 µS/cm	2.00	9.3 µS/cm
12.880 mS/cm	13.02 mS/cm	-0.140 mS/cm	2.00	0.082 mS/cm

#### After Adjustment ; at 84.003 µS/cm, 1413.1 µS/cm, 12.880 mS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
84.003 µS/cm	84.01 µS/cm	-0.007 µS/cm	2.00	0.58 µS/cm
1413.1 µS/cm	1413 µS/cm	0.1 µS/cm	2.00	9.3 µS/cm
12.880 mS/cm	12.87 mS/cm	0.010 mS/cm	2.00	0.082 mS/cm

The End of Certificate

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DKSH Technology Limited  
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2533 Sukhumvit Road, Bangkok, Phra Khanong, Bangkok 10260  
Phone : +66 2639 7000 Email : info.calibration@dksh.com Website : www.dksh.com/scientific-thailand

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CAL-FM-C24-09: 12 Sep 2022





## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00055577

ชนิดเครื่องมือ: CONDUCTIVITY METER

รุ่น: ORION STAR A215

หมายเลขเครื่อง: X58031

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
26 Dec 2024			26 Dec 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
pH Meter and Conductivity Meter					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
Automatic titrator					
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ: \* ไม่กดเลื่อน ขึ้น-ลง,ซ้าย-ขวา กดยาว

Mr. Pongpisut Suebchantha

Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prachinburi, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration

Equipment : Digital Thermometer with Probe

Model : ORION STAR A215

Serial No. : X58031

Manufacturer : Thermo Scientific

ID No. : -

Certificate No. : C15241275

Issued Date : 26 December 2024

Job No. : WO-00055577

Page : 1 of 2

Condition : In Condition

Customer : ALS Laboratory Group (Thailand) Co., Ltd

104 Soi Pattanakarn 40, Pattanakarn Rd.,

Suan Luang, Bangkok 10250 Thailand

Environment Condition : Temperature:  $30^{\circ}\text{C} \pm 10^{\circ}\text{C}$   
Humidity:  $55\% \text{RH} \pm 25\% \text{RH}$   
Voltage:  $220 \text{ VAC} \pm 10\%$

Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )

104 Soi Pattanakarn 40, Pattanakarn Rd.,

Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech

Calibration Date : 26 December 2024

The Method used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by:  
Quality Reborn Co.,Ltd. (QR)

(Miss Kaewkan Suradech)

Person in charge

(Mr. Tweewong Thaihiang)

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 the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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2533 Sukhumvit Road, Bangkok, Prachinburi, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C15-14: 06 Dec 2022



Certificate No.: C15241275

Page: 2 of 2

### Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-3149	26 November 2024	26 November 2025

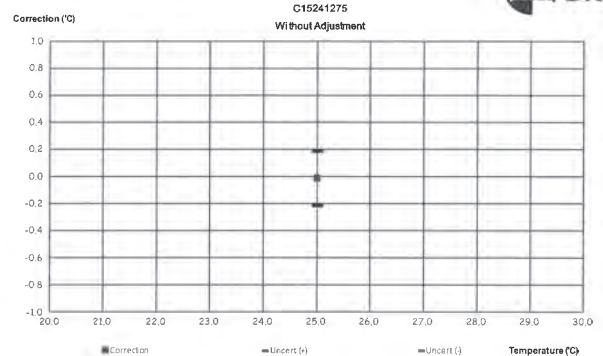
### Calibration Results:

#### Without Adjustment

Sensor Type: RTD Electrode Serial No.: YV1-18416 Channel: -  
Diameter (mm): 15 Length (mm): 120 Immersion (mm): 120

Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty ( $\pm$ °C)
25.0	24.988	25.0	-0.012	0.20

The End of Certificate



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2533 Sukhumvit Road, Bangkok, Prachinburi, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C15-14: 06 Dec 2022

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## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

Equipment : Digital Thermometer with Probe

Certificate No. : C15241275

Serial No. : X58031

Model : ORION STAR A21:

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
26-Dec-2024			26-Dec-2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor ( In / Ex )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ

Ms. Kaewkan Suradech  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand

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## Certificate of Calibration

Equipment: Automatic Titrator  
Model: TitroLine 7000  
Serial No.: 10013826  
Type of Titration: Motor - driven  
Exchange Unit Model: WA-20  
Burettes Model: TZ 3920  
Manufacturer: SI Analytics  
Condition: In condition

Certificate No.: C32240068  
Issued Date: 27 December 2024  
Job No.: WO-00055577  
Page: 1 of 2  
Exchange Unit S/N: 10045524  
S/N, Nr: 007734 Nominal Vol.: 20 ml

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.2 °C  
Relative Humidity 60 %RH ± 1.5 %RH  
Atmospheric Pressure 1014 mbar ± 0.4 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 26 December 2024

The Method used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

(Mr. Atachai Ngamchanat)  
Person in charge

(Miss Kaewkan Suradech)  
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 the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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2533 สุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand

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CAL-FM-C32-11-07 Nov 2022

Certificate No.: C32240068 Page: 2 of 2

## Calibration Results:

Nominal Volume 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V <sub>me</sub> ) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	Sr (μl)		
10%	2.0000	2.0005	0.003	0.5	0.003	0.6	0.69	2.03
50%	10.0000	10.0077	0.039	7.7	0.003	0.7	0.92	2.00
100%	20.0000	20.0081	0.040	8.1	0.009	1.7	1.8	2.05

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl <sup>a</sup>	± % <sup>b</sup>	± μl <sup>c</sup>
≤1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00055577

ชนิดเครื่องมือ: Automatic Titrator รุ่น: TitroLine 7000

หมายเลขเครื่อง: 10013826

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
26 Dec 2024			26 Dec 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ของใส่ตัวอย่าง, ภายในในเครื่อง )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด - เปิด เครื่อง ( On-Off Switch )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด ( Keypad )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ ( Display, Screen Contrast )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Spectrophotometer</b>					
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง ( Battery Backup ) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น ( Wavelength Control )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น ( Wavelength Check )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง ( UV < 3,000 hour )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง ( Visible < 5,000 hour )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ชุดวัดหลายตัวอย่าง ( Carousel Module )	<input type="checkbox"/>	<input type="checkbox"/>	
<b>pH Meter and Conductivity Meter</b>					
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode ( Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลวก Electrode ( Dust Protection Hood )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด ( Stand )	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Turbidimeter</b>					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด ( No Sample )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง ( >= 2.5 ไม่น้อย 3.0 )	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Automatic Titrator</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อจ่ายยาและอุปกรณ์ประกอบ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ขอแนะนำ

Mr. Atachai Ngamchanat  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
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CAL-FM-C32-11-07 Nov 2022

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2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
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CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration



Equipment: Automatic Titrator  
Model: TitroLine 7000  
Serial No.: 10013826  
Type of Titration: Motor - driven  
Exchange Unit Model: WA-20  
Burettes Model: TZ 3920  
Manufacturer: SI Analytics  
Condition: In condition

Certificate No.: C32240069  
Issued Date: 27 December 2024  
Job No.: WO-00055577  
Page: 1 of 2  
Exchange Unit S/N: 10045489  
S/N, Nr: 007773 Nominal Vol.: 20 ml

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 21 °C ± 0.3 °C  
Relative Humidity 61 %RH ± 1.8 %RH  
Atmospheric Pressure 1014 mbar ± 0.6 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 26 December 2024

The Method used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

(Mr. Atachai Ngamchanat)  
Person in charge

(Miss Kaewkan Suradech)  
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 the Guide to Expression of Uncertainty in Measurement (GUM).  
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2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C32-11: 07 Nov 2022



Certificate No.: C32240069 Page: 2 of 2

### Calibration Results:

Nominal Volume 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V <sub>m</sub> ) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	S <sub>r</sub> (μl)		
10%	2.0000	1.9986	-0.007	-1.4	0.003	0.6	0.70	2.03
50%	10.0000	9.9932	-0.034	-6.8	0.003	0.6	0.90	2.00
100%	20.0000	19.9915	-0.042	-8.5	0.002	0.5	1.5	2.00

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume ml	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl <sup>a</sup>	± % <sup>b</sup>	± μl <sup>c</sup>
≤1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

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DKSH Technology Limited  
2533 ซอยพลาตินัม แขวงบางนา เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C32-11: 07 Nov 2022

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม



เลขที่ใบงาน: WO-00055577

ชนิดเครื่องมือ: Automatic Titrator รุ่น: TitroLine 7000

หมายเลขเครื่อง: 10013826

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
26 Dec 2024			26 Dec 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
pH Meter and Conductivity Meter					
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
Automatic titrator					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ระบบผสมยาและอุปกรณ์ประกอบ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

เห็นด้วย/ไม่เห็นด้วย :

Mr. Atachai Ngamchanat  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ซอยพลาตินัม แขวงบางนา เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-R31-03: 20 Jul 2022



## TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

### CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

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

Cert.No.: 24TW28  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Received Date : 01 February 2024  
Test Date : 02 February 2024  
Reference : 2402-0008DSC-10  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Laboratory Condition : Temperature (25 ± 5) °C  
Humidity (50 ± 20) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method  
Tested by : Walalak Sirithean  
Approved by :   
Approved Signatory  
(✓) Salthip Meangmai  
( ) Warakorn Lemgatrakul  
( ) Ponpan Palpim

Issue Date : 7 February 2024





Cert.No.: 24TW28  
Page.: 2 of 2

#### Condition of this result of calibration

##### 1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	1124013382	140RC006	23MM18	20 Feb 2024

##### 2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 17A100064

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.18	8.18	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intent to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

-o-o-



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.: 24LM15  
Page.: 1 of 2

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Location : TPA Chemistry Calibration Laboratory  
Received Order : 01 February 2024  
Calibrated Date : 02 February 2024  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %  
AC Line Voltage : (220 ± 22) V  
Calibrated by : Warakorn Lemgagtrakul  
Approved by :   
( ) Pornthippa Tameyakul  
( ) Ponpan Palpim  
(✓) Suwit Imjai  
Issue Date : 7 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2402-0008DSC-13  
Procedure Used :-

Cert. No.: 24LM15  
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

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

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	23I1216	TPA	11 Oct 2024

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

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

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

Result of Calibration :- ( \* ) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 17A100064

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	80	20.003	19.92	-0.083	0.15	2.00

UUC\* : Unit Under Calibration

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

-o-o-



## Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851, +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T241495

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber (Incubator)  
Manufacturer : MEMMERT  
Model : ICP 750  
Serial No. : F818.0033  
Customer Code : BKK\_EN0272  
ID No. : T8041A4  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250  
Customer Location : Wet Chemistry Lab 2  
Date of Receipt : 14 August 2024  
Calibrated By : Sujjar Naknakred (Site Calibration Manager)  
Approved By : / Boonchai Suriyawong (Assistant Calibration Manager)  
Date of Issue : 27 AUG 2024

REVIEW BY   
APPROVED BY   
NEXT CAL DATE 22/08/25

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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.



Certificate No. T241495

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Incubator )  
Date of Calibration : 22 August 2024 ( Finished Time 11:19 AM )  
Environment : Temperature 22.3-23.0 °C  
Line Voltage 222.5-227.5 V

### Condition of this results of test. :

- This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986. )  
All data show below were final values and the initial data may be obtained upon request.  
The temperature scale used was based on ITS - 90.

### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	27-(CH1)-10	T240709	19 April 2025
RTD	100 ohm	28-(CH1)-10	T240709	19 April 2025
DATA LOGGER	34970A	T149	T240709	19 April 2025

### 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244. )

### 4. Condition of calibrated item : good

#### UUC Description :

Time Constant ☒ 1 Hour ☒ 38 Minute At ☒ 20 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

### 5. Result of test :

( ) without adjustment ( X ) after adjustment

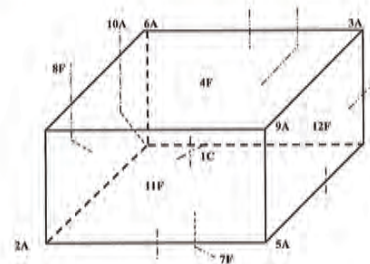
Approved By

FM-L15 118/18-08-66

Certificate No T241495

Page 3 of 4

## Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C =	27-CH1
2A =	27-CH2
3A =	27-CH3
4F =	27-CH4
5A =	27-CH5
6A =	27-CH6
7F =	27-CH7
8F =	27-CH8
9A =	27-CH9
10A =	27-CH10

11F =	28-CH1
12F =	28-CH2

Approved By

FM-L15 118/18-08-66

Certificate No. T241495

Page 4 of 4

## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8	27-CH9	27-CH10
20.0	20.32	20.32	20.29	20.23	20.30	20.34	20.40	20.16	20.34	19.62
	28-CH1	28-CH2								
	19.70	19.65								

Chamber ( Incubator )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
20.0	19.9	20.1	20.01	0.04	0.19	0.38	2.00

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By

FM-L15 118/18-08-66

Certificate No. T242116

Page 1 of 4

## Certificate of Calibration

Equipment : Hot Block

Manufacturer : Environmental Express

Model : B3000-240

Serial No. : 2021CODW148

Customer Code : BKK\_EN0370

ID No. : T2940A5

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

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

Customer Location : Wet Chemistry Lab 2

Date of Receipt : 25 December 2024

Calibrated By : Atiphong Rongrat ( Technician )

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 27 JAN 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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L12 109/30-05-57



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T242116

Page 2 of 4

### Calibration Report

Equipment : Hot Block  
Date of Calibration : 2 January 2025  
Environment : Temperature : 20.1-23.4 °C  
Line Voltage : 222.1-227.3 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert 29 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

#### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

#### 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

#### 4. Condition of calibrated item : good

##### Equipment Description :

Time Constant : 2 Hour 30 Minute At 150 °C  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

#### 5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By.

FM-L13 108/30-05-57



## Metrological Center

SCI ECO Services Company Limited

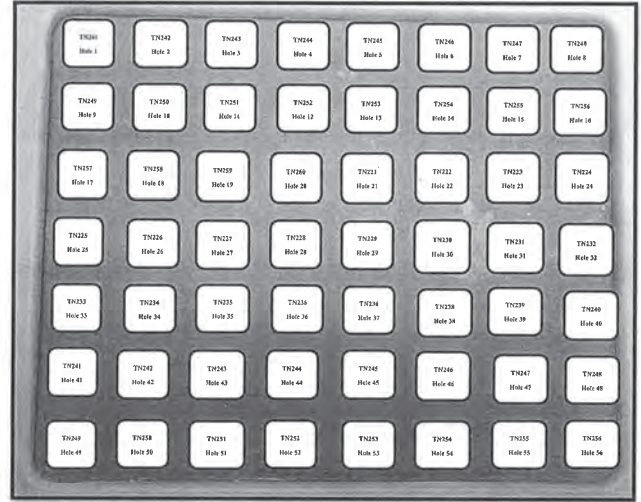
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T242116

Pa 3 of 4

### Calibration Report



#### FRONT CONTROL

Approved By.

FM-L13 108/30-05-57



## Metrological Center

SCI ECO Services Company Limited

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Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T242116

Page 4 of 4

### Calibration Report

#### Measurement Results

CAL POINT		Average Standard Reading at each position (°C)									
		TN241 Hole 1	TN242 Hole 2	TN243 Hole 3	TN244 Hole 4	TN245 Hole 5	TN246 Hole 6	TN247 Hole 7	TN248 Hole 8	TN249 Hole 9	TN250 Hole 10
150	Max	149.78	150.72	150.64	150.94	150.79	151.11	149.77	150.20	150.18	150.28
	Min	149.57	150.52	150.47	150.79	150.65	150.99	149.59	150.06	150.03	150.15
	Average	150.15	150.71	150.71	150.58	150.40	150.52	150.76	150.57	150.49	150.21
	Max	150.32	150.22	150.60	150.51	150.87	150.45	150.37	149.49	150.18	150.33
	Min	150.19	150.04	150.46	150.40	150.74	150.30	150.26	149.33	150.03	150.18
	Average	150.25	150.13	150.53	150.46	150.80	150.37	150.31	149.41	150.11	150.26
	Max	150.49	150.86	149.10	149.64	149.11	149.69	149.75	149.82	150.16	150.34
	Min	150.24	150.63	148.90	149.43	148.94	149.54	149.61	149.69	150.07	150.24
	Average	150.36	150.74	149.00	149.53	149.03	149.62	149.68	149.76	150.11	150.29
	Max	149.03	149.54	149.50	149.49	150.85	150.73	150.62	149.84	150.12	150.09
	Min	148.91	149.43	149.36	150.72	150.72	150.52	149.94	149.78	150.01	149.98
	Average	148.98	149.49	149.43	150.10	150.78	150.67	149.98	149.81	150.06	150.03
	Max	150.86	150.14	150.35	150.97	151.03	151.09	149.81	150.16	149.49	149.51
	Min	150.80	150.00	150.19	150.81	150.85	150.96	149.69	150.02	149.35	149.35
	Average	150.83	150.07	150.27	150.89	150.94	151.02	149.75	150.09	149.42	149.43
	Max	149.71	150.33	150.59	149.42	149.87	149.40				
	Min	149.56	150.17	150.49	149.31	149.74	149.29				
	Average	149.64	150.25	150.54	149.37	149.81	149.35				

Hot Block		Temperature Distribution	
Setting (°C)	Reading (°C)		Uncertainty (± °C)
	Min	Max	
148.0	147.9	148.1	0.13

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %

Approved By.

FM-L13 108/30-05-57



Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor 7 Ramai 4 Road  
Siam Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375496-7  
www.barscientific.com



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-374/24  
Equipment UV/VIS Spectrophotometer  
Model UV-1800  
Manufacturer Shimadzu  
Serial No. A11454008533 CD  
ID No. BKK\_EN0018  
Date of receipt 13 September 2024  
Date of calibration 13 September 2024  
Date of issue 13 SEP 2024

REVIEW BY   
APPROVED BY   
NEXT CAL DATE 10/19/2025

Customer name ALS Laboratory Group (Thailand) Co., Ltd.  
Address 104 Soi Phattanakarn 40, Phattanakarn Road, Phattanakarn, Suan Luang, Bangkok 10250

Temperature (25.3 - 26.7) °C (On site)  
Humidity (50.4 - 55.9) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Preparation Lab

Calibration Procedure In-house method WH-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 106372 and 106371  
Photometric Accuracy is traceable to certificate No. 106364 and 111398  
Stray Light is traceable to certificate No. 106377  
The above certificate are traceable to SI unit through Stama Scientific Ltd.  
(UKAS accredited calibration laboratory NO. D659)

Calibrated by Mr. Wanchana Jantroy

Approved by

Mr. Sonthi Temboonsakdi  
Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

EN1157:2012, EN1157:2012 (2019)





Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor7 Rama4 Road  
Sikom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375495-7  
www.barscientific.com



## Certificate of Calibration

Certificate No. BSOC-UV-374/24

Number of Page(s)

2 of 3

Calibration Results:

### 1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.55	-0.15	0.18
334.02	333.85	-0.17	0.18
418.53	418.57	0.04	0.18
572.99	572.97	-0.02	0.18
879.41	879.17	-0.24	0.18

### 2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7171	0.7169	-0.0002	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8345	-0.0009	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2786	0.2781	-0.0005	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.6199	0.6194	-0.0005	0.0075

\*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
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FM-UV-708-02 Rev.01 (23/01/23)



Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor7 Rama4 Road  
Sikom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375495-7  
www.barscientific.com



## Certificate of Calibration

Certificate No. BSOC-UV-374/24

Number of Page(s)

3 of 3

Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5768	0.0004	0.0042
	0.7119	0.7105	-0.0014	0.0042
	1.0188	1.0174	-0.0015	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5613	0.0003	0.0042
	0.7001	0.6984	-0.0017	0.0042
	1.0026	1.0011	-0.0015	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5235	0.5232	-0.0003	0.0042
	0.6614	0.6598	-0.0016	0.0042
	0.9456	0.9444	-0.0012	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5245	-0.0004	0.0042
	0.6975	0.6966	-0.0009	0.0042
	1.0009	0.9994	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5590	0.5588	-0.0004	0.0042
	0.7725	0.7708	-0.0017	0.0042
	1.1125	1.1114	-0.0011	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5896	0.5866	-0.0030	0.0042
	0.7820	0.7804	-0.0016	0.0042
	1.0882	1.0971	-0.0011	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%)	Absorbance (A)
200.85±0.11nm	199.58	0.9520	2.0217

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A.

\*Stray Light not NSC-ONSC Accredited.

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

\*\*\*End of Certificate\*\*\*

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
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FM-UV-708-02 Rev.01 (23/01/23)



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.: 24TM1618

Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE29

Serial No. : L622.0282

ID No. : BKK\_EN0439

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

Location : Organic Preparation Lab

Received Order : 29 October 2024

Calibration Date : 29 October 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by : Kunchit  
Approved Signatory

( ) Ponpan Paipim

( ) Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 30 October 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2410-0782OC-4

### Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	24LM115	TPA	13 Jul 2025

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

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

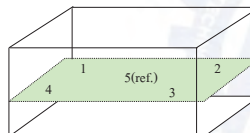
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : ( ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	54	222
Finished of Calibration	25	57	226



Front

Position :	Ref. Std. ID No.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2410-0782OC-4  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM1618  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	85.133	85.212	85.150	84.983	85.096	0.22

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor k
85.0	0.21	0.13	2

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

-00-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



## Certificate of Calibration

Certificate No.: 24T1721  
Page : 1 of 2

Equipment : Digital Thermometer With Sensor  
Manufacturer: Testo  
Model : 106  
Serial No.: 83637027/0122  
ID No.: BKK\_LG0060  
Condition As-Received: Used Item  
Received Date: 19 September 2024  
Calibration Date: 03 October 2024 to 09 October 2024  
Reference: 2409-0690DSC  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller.  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Black Slack Thermometer	1560	8C454	241598	06 Jun 2025
2) PRT Scanner Module	2562	A01303	241598	06 Jun 2025
3) Industrial Platinum Resistance Thermometer	5627-12	571971	241598	06 Jun 2025

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

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

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

REVIEW BY: *Chayathorn P.*  
APPROVED BY: *Nirakorn P.*  
NEXT CAL DATE: 03/10/25

Calibrated by: Anuchit Pangchata  
Issue Date: 10 October 2024

Approved Signatory :  
[ ] Phalinee Prabpaipal  
[ ] Chatchawan Khunpiluek  
[✓] Wanlop Larpkem



Cert. No.: 24T1721  
Page.: 2 of 2

Result of Calibration:- Without Adjustment  
Function: Temperature measurement  
Dimension of probe : Diameter 3 mm., Length 55 mm. Sheath material : Stainless Steel

Immersion Depth ( mm. )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of Measurement ( ± °C )
50	25.0042	25.0	-0.0042	0.12
50	30.0003	30.0	-0.0003	0.12
50	35.0019	35.1	0.0981	0.12
50	40.0025	40.1	0.0975	0.12
50	45.0039	45.1	0.0961	0.12

**UUC\*** : Unit Under Calibration  
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor *k* = 2, providing a level of confidence of approximately 95%.

-00-

BKK\_EL0043



Agilent Technologies

Agilent Technologies (Thailand) Limited  
11 CHU LIANG BLDG. 22/F UNIT A.D  
988 RAMA 4 ROAD, SILOM, BANGKOK  
Bangkok 10500 Thailand

Tel: +662 637 6363  
Fax: +662 632 4334  
Email: ccc-sm@agilent.com  
Web: www.agilent.com/chem

### Customer Contact:

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan  
TAX ID : 0105540004859  
chanattagarn.inchom@alaglobal.com  
227158760

### Invoice To:

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

### SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70371013
Service Request:	Service Request Date:
Service Order: 8006676060	Service Confirmation: 990505441

REVIEW BY: *Tattaporn C.*  
APPROVED BY: *Smita M.*  
NEXT CAL DATE: 31/1/2026

### Delivery Site:

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

Location:  
Room  
Bldg  
Lab  
Dept

### Direct Inquiries to:

Contact Name: Customer Contact Center  
Contact E-mail: ccc-sm@agilent.com  
Contact Telephone: +662 637 6363  
Contact Fax: +662 632 4334

Agilent Technologies (Thailand) Limited, Head Office  
11 Chu Liang Bldg. 22/F Unit A.D  
988 Rama 4 Road, Silom, Bangkok,  
Bangkok 10500 Thailand  
Tax ID: 0105542088218

Agilent N.A. Bangkok Branch  
399 Interchange 21 Building, Sukhumvit Road, Klongtoey New  
Sub-district, Wattana District, Bangkok 10110 Thailand  
Acc. No. 912-4452-007,  
THB-Krung Thai Bank PCL  
Siam Square Bldg. 416/1-2 Rama 1 Rd. Pathumwan, BKK 10330  
Thailand

ORIGINAL



Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
08410A	SPS 4 Autosampler	AU15430722	ICP MS 7900	SYS-IM-7900
08411A	ISIS 3 for Agilent 7850/7800/5900	JP15510227	ICP MS 7900	SYS-IM-7900
03292A	PSC 8106T Chiller	ZU15A1848	ICP MS 7900	SYS-IM-7900
08403A	Agilent 7900 ICP-MS	JP15471169	ICP MS 7900	SYS-IM-7900

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQQ	Enterprise Operational Qualification	1.00	Agreement Entitlement 100 % covered	04.10.2024	04.10.2024
1010	0105-5950	ICP-MS Checkout Solutions	1.00	Agreement Entitlement 100 % covered		

Additional Information:

Service Information:

<b>Problem Description:</b> *VNU-EQQ-IM-7900-5001250855		
<b>Service Provided:</b> Perform: OQ Hardware: Test QDS login, auto sampler, Auto tune, BG and 20 Min stability. I calibrate the instrument No BKK_EL0043 test all pass.		
<b>Service Overview Code:</b> Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Hours:</b> 7.0	<b>Travel Hours:</b> 2.0	
<b>Customer Field Service Representative Name:</b> Pantkeap Kurasathain	<b>Customer Field Service Representative Signature:</b> 	<b>Date:</b> 09 Oct 2024
<b>Customer Name:</b> Supakwan Mak	<b>Customer Signature:</b> 	<b>Date:</b> 08 Oct 2024
<b>Additional Comments:</b>		




**Metrological Center**  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110  
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 1 of 6

Certificate of Calibration

**Equipment** : HEATING BLOCK  
**Manufacturer** : Environmental Express  
**Model** : SC 196  
**Serial No.** : 6974CECW3285  
**Customer Code** : BKK\_EL0054  
**ID No.** : T5306A3  
**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250  
**Customer Location** : Acid Digestion Lab  
**Date of Receipt** : 26 February 2025  
**Calibrated By** : Atiphong Rongrat ( Technician )  
**Approved By** :  / Boonchai Suriyawong (Site Calibration Manager)  
**Date of Issue** : 07 MAR 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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



**Metrological Center**  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110  
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 2 of 6

Calibration Report

**Equipment** : HEATING BLOCK  
**Date of Calibration** : 4 March 2025  
**Environment** : Temperature : 24.4-24.9 °C  
Line Voltage : 221.6-226.3 V  
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 2 Hour 40 Minute At 95 °C  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

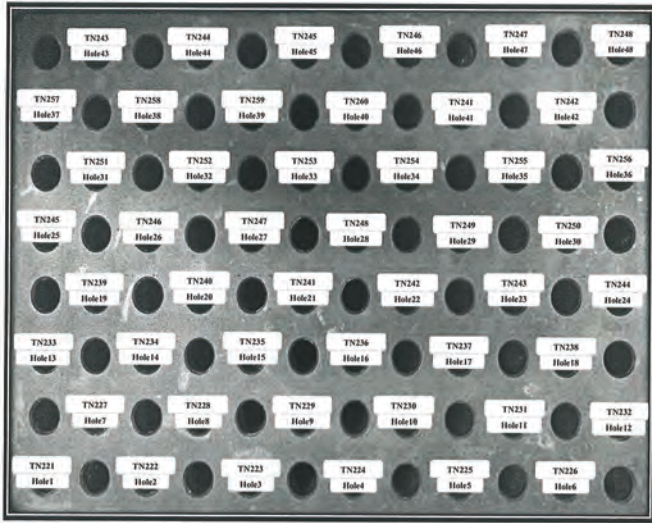
5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By: 



### Calibration Report



FRONT CONTROL

Approved By. 

FM-L13 108/30-05-57

### Calibration Report

#### Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	Max	94.85	95.37	95.03	95.25	95.52	94.75
	Min	94.17	94.66	94.38	94.63	94.87	94.12
	Average	94.51	95.02	94.70	94.94	95.20	94.43
R2 Hole7-Hole12	Max	94.71	94.56	94.79	95.32	95.44	95.06
	Min	94.05	93.88	94.10	94.65	94.90	94.65
	Average	94.38	94.22	94.44	94.99	95.17	94.85
R3 Hole13-Hole18	Max	95.26	95.43	95.40	95.71	95.41	95.06
	Min	94.54	94.64	94.71	95.10	94.86	94.42
	Average	94.90	95.03	95.06	95.41	95.13	94.74
R4 Hole19-Hole24	Max	95.13	95.06	95.68	96.16	95.35	95.80
	Min	94.39	94.43	94.86	95.51	94.88	95.12
	Average	94.76	94.73	95.27	95.83	95.12	95.46
R5 Hole25-Hole30	Max	94.95	95.81	95.39	95.82	95.66	95.66
	Min	94.47	95.03	94.67	94.99	94.84	94.87
	Average	94.71	95.42	95.03	95.41	95.25	95.27
R6 Hole31-Hole36	Max	96.07	95.34	96.28	95.39	94.95	95.12
	Min	95.28	94.55	95.51	94.62	94.13	94.35
	Average	95.67	94.95	95.90	95.00	94.54	94.73
R7 Hole37-Hole42	Max	95.15	95.63	96.11	95.09	95.34	95.51
	Min	94.38	94.88	95.32	94.28	94.54	94.72
	Average	94.76	95.25	95.71	94.69	94.94	95.11
R8 Hole43-Hole48	Max	95.84	95.87	95.44	95.72	95.65	95.75
	Min	95.06	95.10	94.60	94.95	94.87	94.98
	Average	95.45	95.48	95.02	95.34	95.26	95.36

Approved By. 

FM-L13 108/30-05-57

### Calibration Report

#### Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	Max	104.21	104.40	104.60	105.27	105.24	105.19
	Min	104.15	104.02	104.25	104.94	104.91	104.93
	Average	104.32	104.21	104.42	105.10	105.08	105.06
R2 Hole7-Hole12	Max	105.20	105.45	105.58	105.96	105.81	106.03
	Min	104.92	105.14	105.29	105.64	105.53	105.79
	Average	105.06	105.29	105.43	105.80	105.67	105.91
R3 Hole13-Hole18	Max	106.09	106.14	105.83	106.25	105.97	105.88
	Min	105.80	105.89	105.57	106.00	105.69	105.65
	Average	105.94	106.01	105.70	106.13	105.83	105.77
R4 Hole19-Hole24	Max	105.87	105.75	105.30	105.07	105.22	105.66
	Min	105.62	105.52	105.13	104.90	105.05	105.49
	Average	105.74	105.63	105.21	104.98	105.14	105.57
R5 Hole25-Hole30	Max	105.62	105.54	105.52	105.75	105.97	105.69
	Min	105.45	105.35	105.31	105.57	105.81	105.49
	Average	105.53	105.44	105.41	105.66	105.89	105.59
R6 Hole31-Hole36	Max	106.19	106.34	106.47	105.96	105.76	105.35
	Min	106.02	106.16	106.31	105.77	105.58	105.18
	Average	106.10	106.25	106.39	105.87	105.67	105.27
R7 Hole37-Hole42	Max	106.21	105.59	105.45	105.36	106.08	106.09
	Min	106.04	105.42	105.28	105.20	105.90	105.92
	Average	106.12	105.51	105.37	105.28	105.99	106.00
R8 Hole43-Hole48	Max	106.54	106.33	105.78	105.38	105.42	105.69
	Min	106.38	106.16	105.60	105.20	105.25	105.52
	Average	106.46	106.25	105.69	105.29	105.33	105.61

Approved By. 

FM-L13 108/30-05-57

### Calibration Report

#### Measurement Results:


HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
102.0	-	102.0	0.43	0.83
107.0	-	107.0	0.20	0.70

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By. 

FM-L13 108/30-05-57



Agilent Technologies (Thailand) Limited  
11 CHU LIANG BLDG. 22/F UNIT A.D  
968 RAMA 4 ROAD, SILOM, BANGKOK  
Bangkok 10500 Thailand  
Tel: +662 637 4363  
Fax: +662 632 4334  
Email: ccc-smt@agilent.com  
Website: www.agilent.com/thai

Service Confirmation Number: 6905876103  
Service Confirmation Date: 23.09.2024

**Customer Contact:**

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan  
TAX ID : 0105540004859  
Chanattagarn.lmchom@alsglobal.com  
27803088

**Invoice To:**

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

**Delivery Site:**

ALS Laboratory Group (Thailand) Co.  
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

**Location:**

Room  
Bldg  
Lab  
Dept

**SERVICE REPORT**

Customer Purchase Order Number:	Customer Number: 70377013
Service Request:	Service Request Date:
Service Order: 6006676091	Service Confirmation: 6905876103

REVIEW BY *Monphen C.*  
APPROVED BY *Santana N.*  
NEXT CAL DATE *30 Mar 2026*

**Direct Inquiries to:**

Contact Name: Customer Contact Center  
Contact E-mail: ccc-smt@agilent.com  
Contact Telephone: +662 637 6363  
Contact Fax: +662 632 4334

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Agilent Technologies (Thailand) Limited, Head Office  
11 Chu Liang Bldg. 22/F Unit A.D  
968 Rama 4 Road, Silom, Bangkok  
Bangkok 10500 Thailand  
Tax ID: 0105540004859

Cutback NA, Bangkok Branch  
399 Interchange 71 Building, Sukhumvit Road, Klongtoey New  
Sub-district, Western District, Bangkok 10110 Thailand  
Attn: Mr. 912-4652-087  
THD-King Thai Bank PCL  
Siam Square Bldg. 418/1-2 Rama 1 Rd, Pathumwan, BKK 10330  
Thailand

ORIGINAL

**Service Instrument:**

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-ID-5100	ICP-OES 5100/5110 System			
G8010A	Agilent 5100 SVDV ICP-OES Spectrometer	MY18010005	ICP OES 5100	SYS-ID-5100
G8410A	SPS 4 Autosampler	AU18440764	ICP OES 5100	SYS-ID-5100

**Service Items:**

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	ED0	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	22.09.2024	23.09.2024
1010	6610030100	Bottle ICP-OES Wavelength 50/0ml, 5 ppm	1.00	Agreement Entitlement - 100 % covered		
1020	5190-7001	Calibration blank solution Spect HNO3	1.00	Agreement Entitlement - 100 % covered		

**Additional Information:**

REVIEW BY *Oranwan T.*  
APPROVED BY *Santana N.*  
NEXT CAL DATE *06/12/25*

**Performance Verification Certificate**  
for Mercury Analyzer

PRODUCT ID **Quicktrace M-8000 , Teledyne Leeman Labs**

Equipment ID **BKK\_EL0128 Mercury Analyzer**

S/N: US22133002

**BKK\_EL0129 Autosampler**

S/N: 052222A560

Customer Name **ALS Laboratory Group (Thailand) Co., Ltd.**

Address **104 Soi Pattana 40, Pattana Rd. Suan Luang, Suan Luang Bangkok 10250 Thailand**

Date of Qualified **December 6, 2024**

Next Due date **December 6, 2025**

This certifies for products which was performed in acceptable criteria specifications

<b>Autosampler &amp; Sample Introduction</b>	<b>PASSED</b>
<b>Analyzer</b>	<b>PASSED</b>
<b>Gas Liquid Separator &amp; Dryer</b>	<b>PASSED</b>
<b>CVAFS Detector</b>	<b>PASSED</b>
<b>Electronics/Mechanical</b>	<b>PASSED</b>
<b>Data station/PC</b>	<b>PASSED</b>
<b>Analytical test</b>	<b>PASSED</b>

**Provided by**

Scientist Instrument Co., Ltd.  
113 Soi Ekachai 44, Ekachai Road  
Khlong Bang Phuran, Bangbon  
Bangkok 10150 Thailand

Certified by *Santana N.*  
**Thunraphol Sakdayos**  
Service Engineer

Service Confirmation Number: 6905876103  
Service Confirmation Date: 23.09.2024

**Service Information:**

<b>Problem Description:</b> WU-00-10-5100-5501253655		
<b>Service Provided:</b> Complete ODIW 5100ICP-OES Equipment ID: BKK_EL0037, all test passed		
<b>Service Overview Code:</b> Repair Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Hours:</b> 4.0	<b>Travel Hours:</b> 2.0	
<b>Customer Field Service Representative Name:</b> Sowan Onkhum	<b>Customer Field Service Representative Signature:</b> <i>Sowan O.</i>	<b>Date:</b> 23 Sep 2024
<b>Customer Name:</b> CHANATTAGARN IMCHOM	<b>Customer Signature:</b> <i>Monphen C.</i>	<b>Date:</b> 23 Sep 2024
<b>Additional Comments:</b>		





## Certificate of Calibration

Cert. No.: 24TM1318  
Page : 1 of 3

Equipment : Autoclave  
Manufacturer : AES CHEMUNEX  
Model : Masterclave 528  
Serial No. : 34677152  
ID No. : BKK\_ML0043

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

Location : Media Preparation Room

Received Order : 26 September 2024  
Calibration Date : 26 September 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Tawatchai Pama

Approved by :   
Approved Signatory

( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

Issue Date : 09 October 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2409-0695OC-6  
Procedure Used :-

Cert. No.: 24TM1318  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 Based on BS 2646-5 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025

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

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )

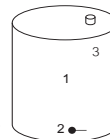
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	25	65	225
Finished of Calibration	26	50	226

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	24-19TC-01
2 =	Temperature sensor	24-19TC-02
3 =	Exhaust port	24-19TC-03



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2409-0695OC-6  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM1318  
Page : 3 of 3

Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( bar )	Uncertainty ( ± °C )	Coverage Factor k
121.0	120.9	1	121.127	0.19	1.5	0.75	2
		2	121.316				
		3	121.292				

Operating parameter Set : Temperature = 38.0 °C  
Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( bar )	Uncertainty ( ± °C )	Coverage Factor k
38.0	38.0	1	37.698	0.17	0.0	0.61	2
		2	37.865				
		3	37.679				

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

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

UUC\* : Unit Under Calibration

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

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

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## Certificate of Calibration

Cert. No.: 24TM1398  
Page : 1 of 3

Equipment : Incubator  
Manufacturer : SHEL-LAB  
Model : 1915A  
Serial No. : 0200599  
ID No. : BKK\_ML0010

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

Location : Incubation & Micrological Reading

Received Order : 03 December 2024  
Calibration Date : 03 December 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Kunchit Promprat

Approved by :   
Approved Signatory

( ) Pornthippa Tameyagul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

Issue Date : 17 December 2024

The Uncertainties are for a confidence probability of approximately 95%

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





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2412-0004OC-1  
Procedure Used :-

Cert. No.: 24TM1398  
Page : 2 of 3

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

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49023932	24LM119	TPA	27 Jul 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

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

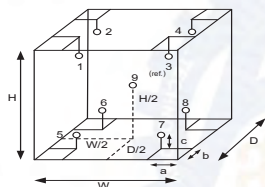
Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	24
REL.Humid. ( % )	51	55
AC Supply ( Volt )	223	223

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	23-16RTD-04
5	19-16RTD-05
6	19-14RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09



#### Probe Installation Details :

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

#### Dimension of Chamber :

D = 0.50 m  
W = 0.75 m  
H = 1.2 m  
Capacity = 0.45 m<sup>3</sup>



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2412-0004OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 24TM1398  
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
35.0	35.0	35.0	0.048	0.40	0.46	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.888	34.840	35.116	35.141	34.750	34.896	34.921	35.054	34.768	0.30

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

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC\* : Unit Under Calibration

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

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

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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.: 24TM667  
Page : 1 of 3

Equipment : Hot Air Oven  
Manufacturer : Binder  
Model : ED 240/E2  
Serial No. : 00-15533  
ID No. : BKK\_ML0013

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

Received Order : 23 April 2024  
Calibration Date : 23 April 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Tawatchai Pama

Approved by :   
Approved Signatory  
( ) Ponpan Paipim  
(✓) Suwit Imjai  
( ) Kunchit Promprat

Issue Date : 26 April 2024

REVIEW BY :   
APPROVED BY :   
NEXT CAL DATE : 23/10/25



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2404-0439OC-8  
Procedure Used :-

Cert. No.: 24TM667  
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

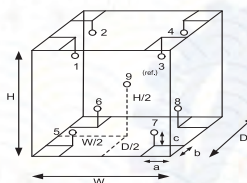
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	23
REL.Humid. ( % )	65	65
AC Supply ( Volt )	223	222



#### Probe Installation Details :

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

#### Dimension of Chamber :

D = 0.50 m  
W = 0.80 m  
H = 0.80 m  
Capacity = 0.24 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	24-19TC-01
2	24-19TC-02
3	24-19TC-03
4	24-19TC-04
5	24-19TC-05
6	24-19TC-06
7	24-19TC-07
8	24-19TC-08
9 (ref.)	24-19TC-09

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Hot Air Oven  
 Condition As-Received : Used Item  
 Reference : 2404-0439OC-8  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source  
 Fresh air setting : Close

Cert. No.: 24TM667  
 Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
180	180	180	0.64	2.7	3.7	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	1	2	3	4	5	6	7	8	9 (ref.)	
180	181,009	181,511	180,922	181,359	181,217	183,659	181,664	181,986	181,474	1.5

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



## Certificate of Calibration

Cert. No.: 25TM460  
 Page : 1 of 3

Equipment : Water Bath  
 Manufacturer : Memmert  
 Model : WNE 45  
 Serial No. : L712.0429  
 ID No. : BKK\_ML0056

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

Received Order : 04 March 2025  
 Calibration Date : 04 March 2025  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %  
 AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Khit Ruttanaprapachai  
 Approved by : Kunchit  
 Approved Signatory

( ) Chakrit Waewwanjua  
 ( ) Suwit Imjai  
 ( ✓ ) Kunchit Promprat

Issue Date : 06 March 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2503-0006OC-2  
 Procedure Used :-

Cert. No.: 25TM460  
 Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44073381	23LM73	TPA	18 May 2025

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

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

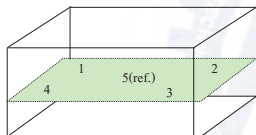
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	24	49	220
Finished of Calibration	25	51	221



Front

Position :	Ref. Std. S/N.:
1	4803988-006
2	4803988-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016



Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2503-0006OC-2  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 25TM460  
 Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.489	44.469	44.497	44.476	44.479	0.15
45.0	45.0	45.0	44.990	44.966	44.997	44.983	44.980	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor <i>k</i>
44.5	0.045	0.035	2
45.0	0.047	0.031	2

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

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

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

**UUC\*** : Unit Under Calibration

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

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

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## ภาคผนวก ด

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



- ๓(๕) นายป/ระเสวีจิต

๗๕) นายประเสริฐ สุระพันธ์  
๗๖) นายบุญล จันทน์เยี่ยม  
๗๗) นายพิรพจน์ ทองอุดมวิศา  
๗๘) นายณัฐพล ทองบุษ  
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๑๒๒) นายภาณุพงศ์ ไชยวงศ์  
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๑๒๔) นายสัญญา ชัยศรีนาม  
๑๒๕) นายณัฐวุฒิ ศรีประเสริฐ  
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๑๒๗) นางสาวกมลิกา จิตร์สว่าง  
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๑๔๒) นางสาวอรยา มีชัย  
๑๔๓) นางสาววิชุดา นาคบุญ  
๑๔๔) นางสาวณัฏฐา จันทะสุน  
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๑๔๘) นายศักดิ์พัฒน์ บุญ  
๑๔๙) นายวิฑูรย์ อนุชิต  
๑๕๐) นายชวโรจน์ ศรีจันทร์  
๑๕๑) นางสาวอริสราวรรณ สวนนอก  
๑๕๒) นางสาวณัฏฐา สิงหา  
๑๕๓) นายณัฏฐกร ฌมโ

๑๕๔) นายประเสริฐ สุระพันธ์  
๑๕๕) นายบุญล จันทน์เยี่ยม  
๑๕๖) นายพิรพจน์ ทองอุดมวิศา  
๑๕๗) นายณัฐพล ทองบุษ  
๑๕๘) นายบุญวัฒน์ ม่วงเพชร  
๑๕๙) นายจตุรวิทย์ ปิตะระมะ  
๑๖๐) นายฤทธิชัย สายธรรม  
๑๖๑) นายพิชัย บุญยงค์  
๑๖๒) นายภาณุพงศ์ ไชยวงศ์  
๑๖๓) นางสาวนารถ คัมภีร์  
๑๖๔) นายสัญญา ชัยศรีนาม  
๑๖๕) นายณัฐวุฒิ ศรีประเสริฐ  
๑๖๖) นายชวโรจน์ นาคพรม  
๑๖๗) นายพงศธร จัยพิทย์  
๑๖๘) นายสิทธิโชค ทาสีดา  
๑๖๙) นายณัฏฐกร อินสุตา  
๑๗๐) นางสาววรณิชา ขาดีวันชัย  
๑๗๑) นางสาวพิมพ์ตะวัน มีนากุล  
๑๗๒) นางสาวเพชรรัตน์ สิริสุขบุญ  
๑๗๓) นางสาวชญาณีน พรหมจันทร์  
๑๗๔) นายกิตติ ทวีราช  
๑๗๕) นายจักริน วัฒนวิศา  
๑๗๖) นายจักรชัย สุขชัย  
๑๗๗) นายณรนาถ ตั้งทองคำ  
๑๗๘) นายศุภชัยพล สมนอก  
๑๗๙) นายทักษิณ ชูศรี  
๑๘๐) นายธนพร นามะบุญนา  
๑๘๑) นายศิริพงษ์ บัวแดง  
๑๘๒) นายณพนธ์ ญักดิ์  
๑๘๓) นายวิฑูรย์ คุณสุทธิ  
๑๘๔) นายณัฏฐพงศ์ สาริน  
๑๘๕) นายปิยะพงษ์ พลชนะศรี  
๑๘๖) นายพงษ์ศิริ ไชยเขียว  
๑๘๗) นายพิรพัฒน์ คำคำ  
๑๘๘) นายภาณุพงศ์ ภาณุชัย  
๑๘๙) นายมงคล ชาติพิทย  
๑๙๐) นายสิริรัตน์ ทองอิน  
๑๙๑) นายอนันดา หันสมัย  
๑๙๒) นายศักดิ์ ฌมโ

๑๑๔) นางสาวอุบล เด็กศิริ

๑๕๔) นางสาวอุบล เด็กศิริ  
๑๕๕) นางสาวณัฏฐา ทองศิริ  
๑๕๖) นายภาณุวัฒน์ วัฒนวิศา  
๑๕๗) นางสาวสุภาวดี เมธีพงษ์  
๑๕๘) นางสาวพรทิศา ศาตพนา  
๑๕๙) นายณัฏฐกร วิริยะนา  
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๑๖๒) นายจิรเมธ ภาณุเดช  
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๑๕๔) นางสาวอุบล เด็กศิริ  
๑๕๕) นางสาวณัฏฐา ทองศิริ  
๑๕๖) นายภาณุวัฒน์ วัฒนวิศา  
๑๕๗) นางสาวสุภาวดี เมธีพงษ์  
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๑๙๙) นายณัฏฐกร สมนอก  
๒๐๐) นายณัฏฐกร สมนอก

๑๑๔) นางสาวอุบล เด็กศิริ

เอกสารแนบท้ายหนังสือเวียนเพื่อขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร  
บริษัท เอเชียแปซิฟิก (ประเทศไทย) จำกัด เลขทะเบียน ๖๒๐๔  
ที่ออก ๐๑๔๐(๑)/ ๑๖ ๑๖ ๑๖ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖  
ค. ขอพบฝ่ายตามหนังสือได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๕๕ รายการ  
น้ำเสีย จำนวน ๕๐ รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1.	Aldicarb	High-Performance Liquid Chromatographic Method <sup>(1)</sup>
2.	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method <sup>(1)</sup>
3.	Aldicarb Sulfonide	High-Performance Liquid Chromatographic Method <sup>(1)</sup>
4.	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
5.	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(1)</sup>
6.	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(1)</sup>
7.	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
8.	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
9.	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
10.	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
11.	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>(1)</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>(1)</sup>
12.	Carbaryl	High-Performance Liquid Chromatographic Method <sup>(1)</sup>
13.	Carbofuran	High-Performance Liquid Chromatographic Method <sup>(1)</sup>
14.	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(1)</sup>
15.	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method <sup>(1)</sup> 2) Closed Reflux, Titrimetric Method <sup>(1)</sup>
16.	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(1)</sup>
17.	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(1)</sup>
18.	Color	ADMs Weighted-Ordinate Spectrophotometric Method <sup>(1)</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
20	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
33	Formaldehyde	Distillation, Colorimetric Method <sup>(4)</sup>
34	Free Chlorine	1) DPD Ferrous Titrimetric Method <sup>(4)</sup> 2) DPD Colorimetric Method <sup>(4)</sup>
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
36	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
37	Hexavalent Chromium	Colorimetric Method <sup>(4)</sup>
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
39	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

40 Manganese...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass spectrometric Method <sup>(4)</sup>
42	Methiocarb	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
44	Methomyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
45	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>(4)</sup> 2) Soxhlet Extraction Method <sup>(4)</sup>
47	Oxamyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
48	Propoxur	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
49	pH	Electrometric Method <sup>(4)</sup>
50	Phenols	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup>
51	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
52	Sulfide	Iodometric Method <sup>(4)</sup>
53	Temperature	Laboratory and Field Methods <sup>(4)</sup>
54	Total Dissolved Solids	Dried at 180 °C <sup>(4)</sup>
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method <sup>(4)</sup>
56	Total Phosphorus	Digestion, Colorimetric Method <sup>(4)</sup>
57	Total Suspended Solids	Dried from 103-105 °C <sup>(4)</sup>
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation <sup>(4)</sup>
60	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation <sup>(4)</sup>
35	Chromium (VI)	Colorimetric Method <sup>(4)</sup>

36 Chrysene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
37	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

56 1,3-Dichloropropene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
63	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

76 γ-HCH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
90	Methyl tert-butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

94 N-Nitrosodiphenylamine...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup> 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4,25)</sup>

110 TPH (C<sub>8</sub>-C<sub>16</sub>)...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C <sub>10</sub> -C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>9,22</sup>
111	TPH (C <sub>16</sub> -C <sub>35</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>9,22</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>62</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
126	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>62</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>

อากาศเสีย...

## อากาศเสีย (ปล่องระบาย) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
2	Arsenic	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
3	Beryllium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
4	Cadmium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
5	Carbon Monoxide	1) Instrumental Analyzer Method <sup>62</sup> 2) Sampling Bag Non-Dispersive Infrared Method <sup>61</sup>
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
10	Cresol	Absorption Sampling, Gas Chromatographic Method <sup>61</sup>
11	Dioxins	Isokinetic Sampling <sup>61</sup>
12	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
13	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>61</sup>

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>61</sup>
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
19	Opacity	Ringelmann's Method <sup>61</sup>
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>61</sup> 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method <sup>61</sup> 3) Instrumental Analyzer Method <sup>61</sup>
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>61</sup> 2) Instrumental Analyzer Method <sup>61</sup>
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>61</sup>
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method <sup>61</sup> 2) Paired Train, Isokinetic Sampling, Gravimetric Method <sup>61</sup>

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
28	Xylene	Absorption Sampling, Gas Chromatographic Method <sup>61</sup>

## สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>1,9,26</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>16,26</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>1,26</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>

5 Beryllium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.14.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.17.19)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.8.16.19)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.8.17.19)</sup>

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(4.6.19)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8.19)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
14	DDO	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup>

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>

22 Mercury...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1.6.20)</sup> 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1.6.30)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(21)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.28)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.28)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.28)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.28)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.28)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.28)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>

- 2-Chlorobiphenyl...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	- 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',5,5',6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,2,24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup> Electrometric Method <sup>(23,24)</sup>
29	pH	
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,6,24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

ดิน...

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13)</sup>
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
15	Benzog(h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13,25)</sup>
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,24)</sup>

23 Cadmium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,14,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,17,19)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,19)</sup>

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(27,28,29)</sup>
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13)</sup>

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	$\alpha$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
75	$\beta$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
76	$\gamma$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry <sup>(21)</sup> 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup>

84 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>

96 Polychlorinated biphenyls (PCBs)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 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 - 2,2',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',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
97	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
108	TPH (C <sub>5</sub> -C <sub>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,23)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(12,23)</sup>
110	TPH (C <sub>18</sub> -C <sub>35</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,23)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(12,23)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>

115 2,4,5-Trichlorophenol...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,29)</sup>
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,29)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
125	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>

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ที่ ๒๒๓๖๔/๔๓๒๓

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวง/กรุงเทพฯ  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ มีนาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรเพื่อปฏิบัติงานวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอมเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเพิ่มเงิน/ค่าจ้าง/เปลี่ยนแปลงบุคลากร และขจัดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๔ มีนาคม ๒๕๖๗

ตามที่นายอภัยสิทธิ์ นริชิต เอมเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอปฏิบัติงานวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๖๑๐๔๔ ของสำนักงาน ๕๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ตามรายละเอียดดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๓. ให้ยกเลิกจำนวนที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวพรณิศา ทุมระ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒) นายกำชัย สุขะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๓) นางสาวศุภรดา ปิ่นมูทะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒. ให้เพิ่มจำนวนที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

๑) นางสาวฐานิดา เกื้อนิจิยะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒) นางสาวณิพัทธ์กุล ลาต๊ะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๓) นางสาวณิพัทธ์ ภัทรวาที ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๔) นายอำนาจ วรพาศน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๕) นายสุเชษฐา นิลสุวรรณ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๖) นายเสกสรรค์ พรพาศน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๗) นายวิจิตร วัฒนสุวน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๘) นายณิพัทธ์ โสภา ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๙) นายณิพัทธ์ งามเพ็ญ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๑๐) นายณิพัทธ์ ชุ่มชื่น ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๑๑) นายณิพัทธ์ สุขพันธ์ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕


๑๒) นายณิพัทธ์ วัฒนสุวน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

อนึ่ง หนังสือแนบนี้...

อนึ่ง หนังสือฉบับนี้จะส่งมอบให้คุณแทนหนังสือต่ออายุขึ้นทะเบียนเพื่อปฏิบัติภารกิจวิเคราะห  
ในวันที่ ๒ กันยายน ๒๕๖๐

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพรศักดิ์ กสิณกร)  
อธิบดีกรมอุตสาหกรรม  
อันเนื่องมาจากพลังงาน

กองวิจัยและเตือนภัยมลพิษโรงงาน  
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ  
โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕  
โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕  
ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๘ ธันวาคม ๒๕๖๓

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒ ธันวาคม ๒๕๖๓


ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์  
จำนวน ๘ ราย ได้แก่

๑) นายประจักษ์ วรรณสุขชัย	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๐
๒) นายจิรวัฒน์ ขาวละออ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๑
๓) นายทวีวัฒน์ กำคำ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๒
๔) นางสาวอรุณ คำคำล่อง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๓
๕) นายกิตติพงศ์ แซ่ลี้	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๔
๖) นายจิรเมธ ประเสริฐศิริพงษ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๕
๗) นายภัทรพงษ์ มนต์หาทอง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๖
๘) นางสาวจารุวรรณ กระจำพันธุ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๗

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๐ เมษายน ๒๕๖๔

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒ เมษายน ๒๕๖๔

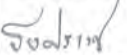
ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์  
จำนวน ๒ ราย ได้แก่

๑) นายอิทธิพงศ์ บัวแดง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๒
๒) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๓

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



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ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๕ มิถุนายน ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๙ พฤษภาคม ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น


กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน  
จำนวน ๑๑ ราย ได้แก่

๑) นายอุดมกร มั่นชื่น	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๔
๒) นายชัชวาล แสนมาตร	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๕
๓) นายเอกรินทร์ บุคสิทธิ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๖
๔) นายพิชญานนท์ อินทริก	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๗
๕) นายศตวรรษ แก้วกันหา	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๘
๖) นายวิกรม มีศิริ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๙
๗) นายคณินท์ คำจันทร์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๐
๘) นายศิริวิทย์ มีไพฑูรย์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๑
๙) นายพิรพงษ์ ศรีคำแหง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๒
๑๐) นายอภิสิทธิ์ ศรีคงแก้ว	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๓
๑๑) ว่าที่ร้อยตรี ภาณุพงศ์ แสนศิริ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๔

อนึ่ง หนังสือฉบับนี้จะส่งมอบให้คุณแทนหนังสือต่ออายุขึ้นทะเบียนเพื่อปฏิบัติภารกิจวิเคราะห์เอกชน  
ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

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