

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal.	Freq. Calibrated (Months)
Water Lab	Dichloride col.	Helandson	90A_100202	4-Oct-23	4-Apr-25	18
Water Lab	Dichloride col.	Proctor	90A_100210	11-Jul-23	11-Jan-25	18
Water Lab	Hardness	Hot Air Oven	90A_100213	23-Sep-24	23-Sep-25	12
Water Lab	Water Rate	Water Rate	90A_100256	1-Mar-24	1-Mar-25	12
Soil	Mercury	Mercury Processor	90A_100228	6-Oct-23	6-Oct-25	12
Soil	Asbestos	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Asbestos	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Asbestos	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Asbestos	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Asbestos	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Asbestos	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Copper	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Copper	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Copper	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Lead	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Lead	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Lead	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Manganese	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Manganese	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Manganese	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Nickel	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Nickel	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Nickel	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Selenium	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Selenium	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Selenium	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Zinc	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Zinc	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Zinc	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Soil	Zinc	ESP-CEES	90A_100227	29-Feb-24	29-Feb-25	12
Soil	Zinc	Hot Block	90A_100254	23-Sep-23	23-Sep-25	18
Soil	Zinc	Chamber - Emission Room	90A_100217	6-Oct-23	6-Jun-25	18
Water	Residual Chlorine	ChlorineChlorometer	90A_100216	13-Sep-23	13-Sep-25	12

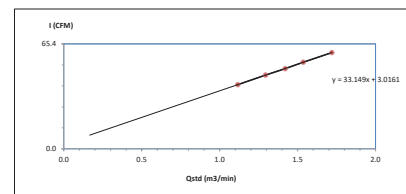
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High Volume Air Sampler Calibration Worksheet

Rojana Industrial Park Prachinburi			
Project Site :	Co. Ltd.	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	สุพรรณบุรี (AT)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume :	NKH.FS0049
Calibrate/Sheet No.:	C-261024-NKH.FS0049	High Volume Model :	TE-51700
Calibrator ID:	RYG.FS0205	High Volume S/N :	5852
Calibrator Model :	TE-5020A	Calibrator S/N :	152567
Calibrator S/N :	1166	Calibrator Intercept :	-0.03613

Test No.	Delta H ₂ O (inch)	Q ₉₀ (m ³ /min)	I: Chart (CFM)	Linear Regression	
1	2.8	1.1168	40	Slope:	33.1405
2	3.8	1.2945	46	Intercept:	3.0161
3	4.6	1.4206	50	Correlation Coefficient:	1.0000
4	5.4	1.5362	54		
5	6.8	1.7194	60		



Approved by :

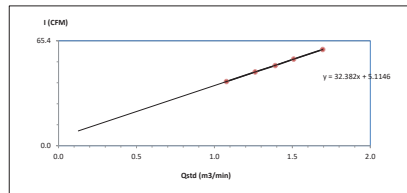
(Mr. Supot Salamteh)
RYG- Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	Rojana Industrial Park Prachinburi Co., Ltd	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	Swanathana (A1)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume ID :	NKH-FS0052
CalibrationSheet No.:	C-261024-NKH-FS0052	High Volume Model :	TE-51700
Calibrator ID:	RYG-FS0205	High Volume S/N:	5855
Calibrator Model :	TE-5028A	Calibrator Slope :	1.52567
Calibrator S/N :	1166	Calibrator Intercept :	-0.03613

Test No.	Delta H ₂ O (inch)	Q ₀ (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	1.0770	40	Slope: 32.3820
2	3.6	1.2609	46	Intercept: 5.1146
3	4.4	1.3902	50	Correlation Coefficient: 1.0000
4	5.2	1.5081	54	
5	6.6	1.6945	60	



Calibrated by: Niyat Approved by: S.S.S
(Mr.Nontachai Uppathamp) (Mr. Supot Salameh)
RYG-Field Services Scientist(2) RYG-Field Services Section Head

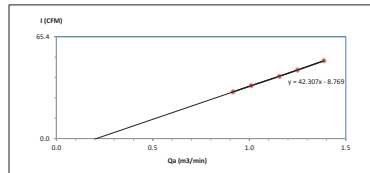
FORM NO. F 06-073 REVISION NO.2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site :	Rojana Industrial Park Prachinburi Co., Ltd	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	Swanathana (A2)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume ID :	RYG-FS0183
CalibrationSheet No.:	C-261024-RYG-FS0183	High Volume Model :	TE-5009X
Calibrator ID:	RYG-FS0205	High Volume S/N:	4791
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q ₀ (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.915	30	Slope: 42.3074
2	2.2	1.010	34	Intercept: -8.7690
3	2.9	1.156	40	Correlation Coefficient: 0.9999
4	3.4	1.250	44	
5	4.2	1.386	50	



Calibrated by: Niyat Approved by: S.S.S
(Mr.Nontachai Uppathamp) (Mr. Supot Salameh)
RYG-Field Services Scientist(2) RYG-Field Services Section Head

FORM NO. F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



Sartorius (Thailand) Co., Ltd.
110 Rama 9 Road, Klongkum, Bangkok 10110
Tel: +66 (0)2 555 1141, e-mail: sartorius.thailand@sartorius.com

Certificate of Calibration

Model Number :	LA1305-F	Certificate No. :	2480008
Description :	Analytical Balance	Issued Date :	Friday, February 23, 2024
Serial Number :	3640004	Reference No. :	225196
ID No. :	RYG-EN0001		
Manufacturer :	Sartorius	Page No. :	1 of 1

Customer Name : A&S Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khw. A. P. O. Chong, Rayong 21145, Thailand
Calibrated Place : A&S Laboratory Group (Thailand) Co., Ltd. (Rajaburi Room)
616/10 Moo 5 T. Maenam Khw. A. P. O. Chong, Rayong 21145, Thailand

Calibrated By : Mr.Chirachit Intham
Calibration Date : Thursday, February 22, 2024
Calibration Procedure No. : This calibration was conducted by using an in-house calibration procedure (number: W-003) based on UKAS LAB 14 : 2019

Metrological data : Capacity : 150 g Readability : 0.0001 g
Ambient Conditions : Temperature : 23.6 °C Humidity : 54.0 % RH Pressure : 1010.0 hPa
Reasons for calibration : ☐ New Installation ☐ Service / Repair ☒ Periodic Calibration
Equipment Condition : ☒ Good ☐ Poor

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 the Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which makes the unit of measurements according to the International System of Units (SI). Repeat of Tolerance (same item list of Sartorius Metrological Specifications).

Model Number	Description	Traceability	Certificate No.	Exp. Date
VC0811-500-00	Balance medium (10g - 500g) (100011-0010)	TCR	M23081978	22-Aug-2028
MHB-38200	Humidity generator (10g - 100g) (100011-0010)	OKH1	C18031846	22-Aug-2024

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

Sartorius (Thailand) Co., Ltd.
110 Rama 9 Road, Klongkum, Bangkok 10110
Tel: +66 (0)2 555 1141, e-mail: sartorius.thailand@sartorius.com



Certificate of Calibration

Model Number :	LA1305-F	Certificate No. :	2480008
Description :	Analytical Balance	Issued Date :	Friday, February 23, 2024
Serial Number :	3640004	Reference No. :	225196
ID No. :	RYG-EN0001		
Manufacturer :	Sartorius	Page No. :	2 of 2

Calibration Results : Without Adjustment

Repeatability	Linearity
This repeatability is the ability of a weighing instrument to display nearly identical values when constant test conditions under the same load within a measurement capacity. It is determined by the repeatability of the weighing unit in the same manner. The standard deviation is used to express repeatability quantitatively.	This unit's off-center loading error is verified by the difference between the results of the load (x = 10 g) at maximum capacity, placed in the middle of the weighing pan and repeat each of four additional measurements (points) (positive defined accuracy) to OIML R76.
Minimum Value (Low Load) : 10 g Tolerance : 0.0001 g Maximum Value (High Load) : 100 g Tolerance : 0.0001 g Standard Deviation : 0.00005 g	Minimum Value : 50 g Tolerance : 0.0004 g Standard Deviation : 0.00005 g

Normal Value	Conversion Mean Value	Displayed Value	(Deviation)	Uncertainty
10 g	10.0000	10.0000	0.0000	0.0000
0.01 g	0.0100	0.0100	0.0000	0.0000
0.05 g	0.0500	0.0500	0.0000	0.0000
0.1 g	0.1000	0.1000	0.0000	0.0000
0.5 g	0.5000	0.5000	0.0000	0.0000
1 g	1.0000	1.0000	0.0000	0.0000
2 g	2.0000	2.0000	0.0000	0.0000
5 g	5.0000	5.0000	0.0000	0.0000
10 g	10.0000	10.0000	0.0000	0.0000
20 g	20.0000	20.0000	0.0000	0.0000
100 g	100.0000	99.9999	-0.0001	0.0004

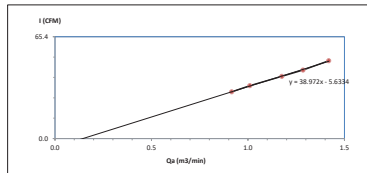
FORM NO. F 06-073 REVISION NO.2



High Volume Air Sampler Calibration Worksheet

Project Site :	Rojana Industrial Park Prachinburi Co., Ltd	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	Swanathana (A3)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume ID :	RYG-FS0294
CalibrationSheet No.:	C-261024-RYG-FS0294	High Volume Model :	TE-5009X
Calibrator ID:	RYG-FS0205	High Volume S/N:	5501
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q ₀ (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.915	30	Slope: 38.9715
2	2.2	1.010	34	Intercept: -5.6134
3	3.0	1.175	40	Correlation Coefficient: 0.9991
4	3.6	1.285	44	
5	4.4	1.418	50	



Calibrated by: Niyat Approved by: S.S.S
(Mr.Nontachai Uppathamp) (Mr. Supot Salameh)
RYG-Field Services Scientist(2) RYG-Field Services Section Head

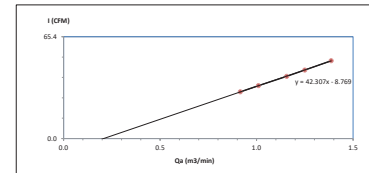
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High Volume Air Sampler Calibration Worksheet

Project Site :	Rojana Industrial Park Prachinburi Co., Ltd	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	Swanathana (A3)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume ID :	NKH-FS0046
CalibrationSheet No.:	C-261024-NKH-FS0046	High Volume Model :	TE-5009X
Calibrator ID:	RYG-FS0205	High Volume S/N:	5847
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Delta H ₂ O (inch)	Q ₀ (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.915	30	Slope: 42.3074
2	2.2	1.010	34	Intercept: -8.7690
3	2.9	1.156	40	Correlation Coefficient: 0.9999
4	3.4	1.250	44	
5	4.2	1.386	50	



Calibrated by: Niyat Approved by: S.S.S
(Mr.Nontachai Uppathamp) (Mr. Supot Salameh)
RYG-Field Services Scientist(2) RYG-Field Services Section Head

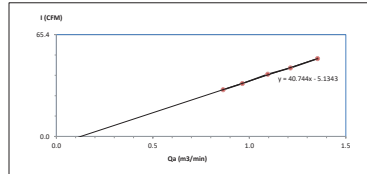
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High Volume Air Sampler Calibration Worksheet

Project Site :	Rojana Industrial Park Prachinburi Co., Ltd	Barometric Pressure (mm Hg) :	758.4
Calibrate Location :	Se1nangsaif (A1)	Temperature (°C) :	33.6
Calibrate Date :	26-Oct-24	High Volume ID :	NKH_F30047
Calibration Sheet No. :	C-261024-NKH_F30047	High Volume Model :	TE-5009X
Calibrator ID :	RYG_F30205	High Volume S/N :	5848
Calibrator Model :	TE-5020A	Calibrator Slope :	0.95561
Calibrator S/N :	1166	Calibrator Intercept :	-0.02266

Test No.	Inlet Flow (l/min)	Q ₀ (m³/min)	Linear Regression
1	1.6	0.864	38
2	2.0	0.964	34
3	2.6	1.096	40
4	3.2	1.213	44
5	4.0	1.353	50



Calibrated by: *[Signature]* (Mr. Montachai Uppathamp)
RYG-Field Services Scientist(2)

Approved by: *[Signature]* (Mr. Supot Salameh)
RYG-Field Services Section Head

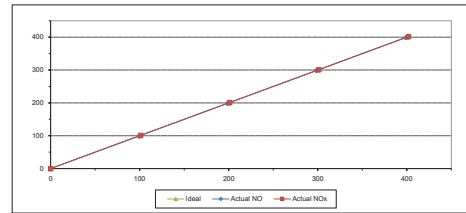
FORM NO.: F 06-074 REVISION NO.:2 ISSUE DATE: 20/11/23



MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	R27SHKTY	Equipment ID	NKH_F30078
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.20	1.20	1.20
2	200.00	198.50	-1.50	-0.75	201.20	1.20	0.60
3	300.00	298.40	-1.60	-0.53	301.20	1.20	0.40
4	400.00	398.80	-1.20	-0.30	402.00	2.00	0.50
AVERAGE (%)				-0.46			0.56



Calibrated By: *[Signature]* (Mr. Jiravut Sakam)
Field Environmental Scientist (3)

Approved By: *[Signature]* (Mr. Sarayuth Jittrantont)
Assistant General Manager

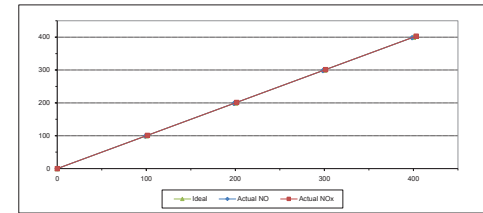
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FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	MB63MPK3	Equipment ID	NKH_F30082
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	101.30	1.30	1.30
2	200.00	198.50	-1.50	-0.75	201.50	1.50	0.75
3	300.00	298.40	-1.60	-0.53	301.40	1.40	0.47
4	400.00	398.50	-1.50	-0.38	403.10	3.10	0.78
AVERAGE (%)				-0.49			0.68



Calibrated By: *[Signature]* (Mr. Jiravut Sakam)
Field Environmental Scientist (3)

Approved By: *[Signature]* (Mr. Sarayuth Jittrantont)
Assistant General Manager

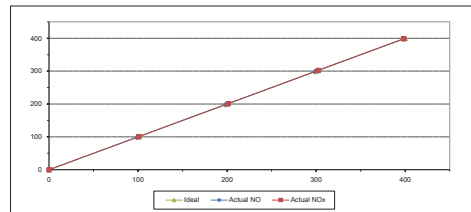
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FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	2-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2199	Equipment ID	RYG_F30282
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	101.00	1.00	1.00
2	200.00	198.00	-2.00	-1.00	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	302.30	2.30	0.77
4	400.00	398.20	-1.80	-0.45	398.60	-1.40	-0.35
AVERAGE (%)				-0.63			0.43



Calibrated By: *[Signature]* (Mr. Jiravut Sakam)
Field Environmental Scientist (3)

Approved By: *[Signature]* (Mr. Sarayuth Jittrantont)
Assistant General Manager

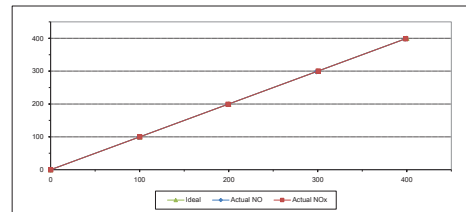
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FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	2-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	7AVB0844	Equipment ID	RYG_F30272
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.50	-1.50	-0.75	199.20	-0.80	-0.40
3	300.00	298.60	-1.40	-0.47	300.50	0.50	0.17
4	400.00	398.10	-1.90	-0.47	398.70	-1.30	-0.33
AVERAGE (%)				-0.61			-0.07



Calibrated By: *[Signature]* (Mr. Jiravut Sakam)
Field Environmental Scientist (3)

Approved By: *[Signature]* (Mr. Sarayuth Jittrantont)
Assistant General Manager

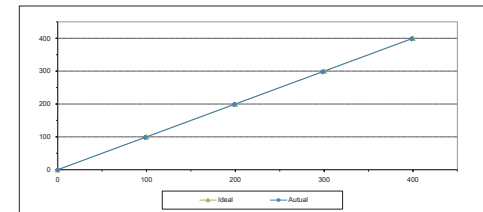
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FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jul-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	CB0MRUP	Equipment ID	NKH_F30079
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.40	-1.60	-1.60
2	200.00	198.70	-1.30	-0.65
3	300.00	298.00	-2.00	-0.67
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.64



Calibrated By: *[Signature]* (Mr. Jiravut Sakam)
Field Environmental Scientist (3)

Approved By: *[Signature]* (Mr. Sarayuth Jittrantont)
Assistant General Manager

ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12

Measurement Results:

The results of calibration and associated measurement uncertainties are reported in the table below.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 1: The results of calibration of relative humidity at 30 °C are reported in table below.

Calibration Range: 10%RH to 80%RH

Air Temperature (°C)	Standard Reading (RH)	UUC Reading (RH)	Error (RH)	Uncertainty (RH)
20.80	19.61	17.7	-2.0	0.81
20.81	30.89	46.1	-1.1	1.3
20.81	61.74	76.9	-1.6	2.2

UUC: Unit Under Calibration

End of Certificate of Calibration



CALIBRATION REPORT

Calibration Number: RD-0107024
Page 1 of 2 Pages

Measurement Item:

Rain gauge with data logger

Manufacturer:

Data logger: Nivetyx
Rain gauge: Nivetyx

Model/Type:

Data logger: 110-WB-250S-R
Rain gauge: 110-WB-250R

Serial Number:

Data logger: A5485
Rain gauge: RD-A5485

ID NO:

NH-F30053

Customer:

A/S laboratory group (Thailand) Co., Ltd.
164 Phatthanasak Rd, Phatthanasak Rd, Phrasang Sub-Lang, Khwa Bang Luang,
Bangkok 10250, Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of 25.3°C and relative humidity of 50.15%.

Measurement Method:

The Rain gauge Unit Under Calibration (UUC) was calibrated by Precision reference bottle with flow adjuster at low rate 0.8 cm per minute or 1 tipping every 30 seconds. The tipping number was determined by procedures below.

- Obtain rain gauge inlet area.
Rain gauge probe diameter is 40 = Diameter/2 = R (mm).
Rain gauge area = πR^2 (14.84) (mm²) = 20.5 cm² UUC (10.18 cm²).
Rain gauge area = 323.6 cm².
- Obtain reference current rain gauge system (tipping) using 30.0 cm² inlet area and 0.5 s of rain.
a) 10000 (mm) / 30.0 s = 333.3 mm/s (inches) = 1.333 (inches/s).
b) 30.00 x 0.8 L volume/10.48 mm tip of rain over 1 m² surface/ 500 ml of rain volume on the rain gauge area = 15.45 mm of rain.
c) Number of tipping = 15.45 / 0.25 mm = 62 tipings.

Note: Rain gauge is fully cleaned and leveling prior the calibration performed.

Measurement Date:

Jun 27, 2024

Issued Date:

Jun 27, 2024

Performed by:

☒ Mr. Surawit Thaisakul
☒ Miss Jiraporn Lamsakul



Approved Signature: Mr. Parinya Booncharon
Calibration Department Manager

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

The results of calibration are reported in table below.

Quantity of TSD (mm)	Determined Tipping	Tipping count	Acceptable Tipping count
200	62	63	60 - 64
500	62	64	60 - 64
800	62	64	60 - 64
1000	62	63	60 - 64
2000	62	63	60 - 64

Remark: The procedure is made to verify the correct reading of the Unit under Calibration rain gauge when a precise volume of water falls into its cone. We suggest that the number of tipping should be within ±2% different from the 62 tipping (correct range 60-64 tipping) it means that the rain gauge meets the manufacturer's acceptable limit.

End of calibration report



Measurement Item:

Cup anemometer

Manufacturer:

Model: VWS-02P

Model/Type:

Data logger: 110-WB-250S-R

Serial Number:

Serial: VWS-02P

ID Number:

Data logger: A5485

Customer:

A/S laboratory group (Thailand) Co., Ltd.

Environmental Condition:

23.0 ± 0.5 °C

Relative Humidity:

50.0 ± 0.5 %RH

Atmospheric Pressure:

1013.0 ± 0.5 hPa

Calibration Conditions:

Wind tunnel cross-section area: 900 cm²

Calibration Date:

27 Jun 2024

Calibration Results:

The table on next page give the measured values.

Calibration by:

☒ Mr. Surawit Thaisakul
☒ Miss Jiraporn Lamsakul

Calibration Date:

27 Jun 2024

Calibration Results:

The table on next page give the measured values.

Calibration by:

☒ Mr. Surawit Thaisakul
☒ Miss Jiraporn Lamsakul

Calibration Date:

27 Jun 2024

Calibration Results:

The table on next page give the measured values.

Calibration by:

☒ Mr. Surawit Thaisakul
☒ Miss Jiraporn Lamsakul

Calibration Date:

27 Jun 2024

Calibration Results:

The table on next page give the measured values.

Calibration by:

☒ Mr. Surawit Thaisakul
☒ Miss Jiraporn Lamsakul

Calibration Date:

27 Jun 2024

Calibration Results:

The table on next page give the measured values.

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

Measurement Results:

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calibrated by a standard air velocity transducer which was installed 40 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 10 m/s to 30 m/s was calibrated by a test tube with precision differential pressure meter which was installed 40 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was exercised on a repeat vertical table of the test tube at center of test section. The measurement was carried out under both wind speed and falling air velocity in the range of 1 m/s to 30 m/s at calibration setting of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

Ref. (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	Ref. (m/s)	Error (m/s)	Uncertainty (m/s)
0.500	23.83	17.00	1.0	-0.1	0.11
1.000	23.83	17.00	1.0	-0.2	0.11
1.500	23.74	17.00	1.5	-0.1	0.11
2.000	23.74	17.00	2.0	-0.1	0.11
2.500	23.65	17.00	2.5	-0.1	0.11
3.000	23.56	17.00	3.0	-0.1	0.11
3.500	23.47	17.00	3.5	-0.1	0.11
4.000	23.38	17.00	4.0	-0.1	0.11
4.500	23.29	17.00	4.5	-0.1	0.11
5.000	23.20	17.00	5.0	-0.1	0.11
5.500	23.11	17.00	5.5	-0.1	0.11
6.000	23.02	17.00	6.0	-0.1	0.11
6.500	22.93	17.00	6.5	-0.1	0.11
7.000	22.84	17.00	7.0	-0.1	0.11
7.500	22.75	17.00	7.5	-0.1	0.11
8.000	22.66	17.00	8.0	-0.1	0.11
8.500	22.57	17.00	8.5	-0.1	0.11
9.000	22.48	17.00	9.0	-0.1	0.11
9.500	22.39	17.00	9.5	-0.1	0.11
10.000	22.30	17.00	10.0	-0.1	0.11

Remarks:

* Calibration results only issued for the tested circumstances and environmental conditions during which calibration took place.

* Validity of standard.

* Reasons of Unit Under Calibration.

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer collection in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not used to make the imaging accurate.



Measurement Results:

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calibrated by a standard air velocity transducer which was installed 40 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 10 m/s to 30 m/s was calibrated by a test tube with precision differential pressure meter which was installed 40 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was exercised on a repeat vertical table of the test tube at center of test section. The measurement was carried out under both wind speed and falling air velocity in the range of 1 m/s to 30 m/s at calibration setting of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

Ref. (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	Ref. (m/s)	Error (m/s)	Uncertainty (m/s)
0.500	23.83	17.00	1.0	-0.1	0.11
1.000	23.83	17.00	1.0	-0.2	0.11
1.500	23.74	17.00	1.5	-0.1	0.11
2.000	23.74	17.00	2.0	-0.1	0.11
2.500	23.65	17.00	2.5	-0.1	0.11
3.000	23.56	17.00	3.0	-0.1	0.11
3.500	23.47	17.00	3.5	-0.1	0.11
4.000	23.38	17.00	4.0	-0.1	0.11
4.500	23.29	17.00	4.5	-0.1	0.11
5.000	23.20	17.00	5.0	-0.1	0.11
5.500	23.11	17.00	5.5	-0.1	0.11
6.000	23.02	17.00	6.0	-0.1	0.11
6.500	22.93	17.00	6.5	-0.1	0.11
7.000	22.84	17.00	7.0	-0.1	0.11
7.500	22.75	17.00	7.5	-0.1	0.11
8.000	22.66	17.00	8.0	-0.1	0.11
8.500	22.57	17.00	8.5	-0.1	0.11
9.000	22.48	17.00	9.0	-0.1	0.11
9.500	22.39	17.00	9.5	-0.1	0.11
10.000	22.30	17.00	10.0	-0.1	0.11

Remarks:

* Calibration results only issued for the tested circumstances and environmental conditions during which calibration took place.

* Validity of standard.

* Reasons of Unit Under Calibration.

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer collection in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not used to make the imaging accurate.



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

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard values under the comparison method. During calibration, this measurement was carried out at 45° intervals in clockwise and counter-clockwise directions after adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed	P ₁ max	P ₁ min	Error	U(95%)
m/s	Degree (°)	Degree (°)	Degree (°)	Degree (°)
5.03	45.000	41	-4	0.80
	90.000	87	-3	0.80
	135.000	133	-2	0.80
	180.000	180	0	0.80
	225.000	227	2	0.80
10.06	270.000	273	3	0.80
	315.000	318	3	0.80
	360.000	359	-1	0.80

Remarks:

¹ Calibration reports only count for the latest circumstances and environmental conditions during which calibration took place.

² Uncertainty of standard.

³ Uncertainty of test under calibration.

End of Certificate of Calibration



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NSC-TIS-TIS 17025
CALIBRATION 0367

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367

Temperature measurement laboratory
Calibration services department

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

Certificate No. : COT-036-87

MEASUREMENT ITEM : Data logger with Temperature sensor
MANUFACTURER : Novataya
MODEL/TYPE : L13-W5-250L-N
SERIAL NUMBER : AS488
ID NUMBER : NRH_750054
CONDITION AS RECEIVED : Used item
CUSTOMER : All laboratory group (Thailand) Co., Ltd.
 104 Phatthanakan Rd., Phatthanakan Rd., Khwaeng Sam Luang, Khut Sam Luang, Bangkok 10250 Thailand.

Calibration procedure:
 The temperature calibration will make by in-house calibration digital up 40(±0.01) according to comparison linked with standard digital temperature probe. The standard temperature probe has been calibrated against temperature probe. The temperature will use new based on ITS-90.

Traceability:
 The measurement results are traceable to the International System of units (SI) through National Institute of Standards and Technology (NIST) Certificate number: 71-0047-24. Certificate number: 71-0101-23

Reference used during calibration:
 1. Standard Temperature Probe Model: 175-100-A500, Serial No.: 607602-05, Due date: 28 May 2023
 2. Digital Temperature Indicator Model: 175-1000-A40-E, Serial No.: 673407-0001, Due date: 18 Sep 2024

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

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 27 Jun 2024
ISSUE DATE : 27 Jun 2024

ENVIRONMENTAL CONDITIONS:
 Ambient condition in the laboratory are as follows:
 Temperature : 28.0 ± 1.0 °C
 Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page gives the measured values.



Approved signature:
 Mr. Panyee Booncharoen
 Calibration Department Manager

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Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 3: This equipment was connected with temperature sensor Model: HMP40 5/16" RS485B07, Dimensions: Diameter 3.2 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
60	30.264	29.8	-0.5	0.099
80	25.051	24.8	-0.3	0.099
80	30.046	29.8	-0.2	0.099
80	35.034	34.7	-0.3	0.099
80	40.024	39.7	-0.3	0.099

USC¹: Unit Under Calibration

End of Certificate of Calibration



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CALIBRATION 0367
Relative humidity and Air Temperature measurement laboratory
 Calibration services department

Temperature measurement laboratory
Calibration services department

CERTIFICATE OF CALIBRATION

Page 1 of 3 Pages

Certificate No. : COT-036-87

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novataya
MODEL/TYPE : Data logger L13-W5-250L-N
SERIAL NUMBER : Sensor 154940
ID NUMBER : Data logger AS488
CONDITION AS RECEIVED : Sensor R3140687
CUSTOMER : Used item
 All laboratory group (Thailand) Co., Ltd.
 104 Phatthanakan Rd., Phatthanakan Rd., Khwaeng Sam Luang, Khut Sam Luang, Bangkok 10250 Thailand.

Calibration procedure:
 The relative humidity and Air Temperature calibration was done by in-house calibration method on W-CI-029 and W-CI-010 according to comparison method with Standard Chamber Atmosphere with temperature sensor and standard humidity generator device.

Traceability:
 The measurement results are traceable to the International System of units (SI) through National Institute of Standards and Technology (NIST) Certificate number: 71-0047-24 and through National Institute of Standards and Technology (NIST) Certificate number: 71-0101-23

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

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 27 Jun 2024
ISSUE DATE : 27 Jun 2024

ENVIRONMENTAL CONDITIONS:
 Ambient condition in the laboratory are as follows:
 Temperature : 28.0 ± 1.0 °C
 Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page gives the measured values.



Approved signature:
 Mr. Panyee Booncharoen
 Calibration Department Manager

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

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NSC-TIS-TIS 17025
CALIBRATION 0367
Relative humidity and Air Temperature measurement laboratory
 Calibration services department

Temperature measurement laboratory
Calibration services department

Continuation of Certificate of Calibration Number COT-036-87

Page 2 of 2 Pages

Measurement Results:

The results of calibration and associated measurement uncertainties are reported in the table below:

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 3: The results of calibration of relative humidity at 50 °C are reported in table below.
 Calibration Range: 20RH to 80RH

Air Temperature (°C)	Standard Reading (RH%)	USC Reading (RH%)	Error (RH%)	Uncertainty (RH%)
28.80	59.61	57.9	-1.7	0.81
29.40	60.46	60.0	-0.5	0.81
29.81	61.70	60.7	-1.0	0.81

USC¹: Unit Under Calibration



End of Certificate of Calibration

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NSC-TIS-TIS 17025
CALIBRATION 0367

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367
Relative humidity and Air Temperature measurement laboratory
 Calibration services department

Temperature measurement laboratory
Calibration services department

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novataya
MODEL/TYPE : Sensor WS-037
SERIAL NUMBER : Data logger L13-W5-250L-N
ID NUMBER : Sensor WS0-AS480
CONDITION AS RECEIVED : Data logger AS480
CUSTOMER : Used item
 All laboratory group (Thailand) Co., Ltd.
 104 Phatthanakan Rd., Phatthanakan Rd., Khwaeng Sam Luang, Khut Sam Luang, Bangkok 10250 Thailand.

Calibration procedure:
 The Cup anemometer was calibrated against standard air velocity reference against 9501-02 and prior tube with precision differential pressure meter reader (DPA400) in velocity in function of (0.01 m/s) wind speed with 500 g/s, cross the section area. The WS-037 being at 40° (0.0001-0.01) Wind energy generator airflow - Part 1, 2, 3. Power performance measurements of electricity producing wind turbine, March 2017, you can see a calibration guideline.

Traceability:
 This certificate involves a traceability of the measurement to measurement the national standards and to realization of the international system of units (SI) through the National Metrology Institute of Thailand via Certificate number: 71-0047-24 and 71-0101-23

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

RECEIVED DATE : 10 May 2024
MEASUREMENT DATE : 13 May 2024
ISSUE DATE : 13 May 2024

ENVIRONMENTAL CONDITIONS:
 Ambient condition in the laboratory are as follows:
 Temperature : 28.0 ± 1.0 °C
 Relative Humidity : 55.0 ± 15.0 %RH
 Atmospheric Pressure : 1010.6 hPa

PLACE OF CALIBRATION : 1. Office type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area: 100 m²
 Wind direction (upwind area): 100 m²
 Diameter of inflating pipe: 100 mm
 Blowing velocity of flow: 0.111 m/s

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (28.1) °C, (46.1) %RH and (1009.3) hPa.

TABULATION OF RESULTS:

The table on next page gives the measured values.

Calibrated by:
☒ Mr. Somwut Thachakul
☐ Mr. Panyee Booncharoen

Approved signature:
 Mr. Panyee Booncharoen
 Calibration Department Manager

Remarks:
 1. Using cross-section area of the wind tunnel.
 2. Resulting cross-section area of the inflating pipe includes mounting pipe.
 3. Diameter of inflating pipe.
 4. Blowing velocity of flow.
 5. Page: 1/2

REVIEW BY:
 APPROVED BY:
 NEXT CAL DATE: 13/11/28

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MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a stand vertical tube of the lowest plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 0.5 m/s to 30 m/s at calibration interval of 4.5 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

UUC [m/s]	Temp. wind tunnel [°C]	Temp. room [°C]	UUC [m/s]	Error [m/s]	U (95%) [m/s]
1.005	25.15	25.15	0.9	0.1	0.11
2.047	25.12	25.15	1.8	-0.2	0.11
2.950	25.10	25.15	2.9	0.1	0.11
4.118	25.28	25.15	3.9	-0.2	0.11
4.92	25.20	25.15	4.0	0.0	0.11
5.97	24.92	25.15	6.0	0.0	0.11
6.97	25.20	25.15	7.0	0.1	0.11
7.91	24.70	25.15	8.0	0.1	0.11
8.89	25.28	25.15	9.1	0.2	0.11
9.90	24.70	25.15	10.1	0.0	0.11
10.91	25.18	25.15	11.1	0.2	0.11
11.91	24.80	25.15	12.1	0.2	0.11
12.94	25.40	25.15	13.1	0.2	0.11
13.94	24.80	25.15	14.2	0.3	0.11
14.97	25.26	25.15	15.1	0.3	0.16
15.88	25.00	25.15	16.2	0.3	0.16

Remarks:

¹ Calibration results only valid for the listed dimensions and environmental conditions during which calibration took place.

² Velocity of standard.

³ Velocity of Unit Under Calibration.

PHOTO OF CALIBRATION SET-UP



Calibration setup of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remarks: The property of the set-up is not true to scale due to being simplified.



Certificate Number
CWB-011-87

JIRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory
ISO/IEC 17025:2017
ACC-101-18-17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department

NAC - 151 - TIS 17025
CALIBRATION 0367

Certificate Number

CWB-011-87

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature

Relative Humidity

Atmospheric Pressure

PLACE OF CALIBRATION

CALIBRATION CONDITION

Preconditioning

Measurement Condition

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Approved signature:

Remarks:

¹ Ability of comparison area of the wind tunnel

² Accuracy of comparison area of the wind tunnel

³ Accuracy of comparison area of the wind tunnel

⁴ Accuracy of comparison area of the wind tunnel

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Measurement Results

The results of calibration and associated measurement uncertainties are reported in the table below.

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 3: The results of calibration of relative humidity at 30 ° are reported in table below.

Calibration Range: 20.0% to 80.0%

Air Temperature (°C)	Standard Reading (mm)	USC Reading (mm)	Error (mm)	Uncertainty (mm)
29.8	10.1	10.0	-0.1	0.0
29.9	49.9	49.5	-0.3	0.3
29.9	80.7	79.6	-1.1	1.4

USC: Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS RECEIVED

CUSTOMER

Calibration procedure:

The Cup anemometer was calibrated against

standard air velocity transducer against 0.01/0.02

and after tube with precision differential pressure

meter model 0.01/0.02 in velocity calibration of

100 mm wind speed gauge 0.01/0.02 class one

series one. The US (C) 302 found all 0.01/0.02

1.5. Wind energy generation system - Part 12

1. Power performance measurement of

electricity producing wind turbines, March 2017

was used for specification quality.

Traceability:

The certificate provides a traceability of the

measurement to the International System of Units (SI)

through the National Metrology Institute of Thailand via

Certificate number: 0.01/0.02 and 0.01/0.02

Uncertainty of Measurement:

The reported uncertainty of measurement is

based on the standard uncertainty multiplied by a

coverage factor k=2, which for a normal

distribution corresponds to a coverage probability

of approximately 95%. The standard uncertainty

has been determined in accordance with the

ISO 91:2004 Evaluation of measurement data - Guide to

the expression of uncertainty in measurement.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

Relative Humidity

Atmospheric Pressure

PLACE OF CALIBRATION

CALIBRATION CONDITIONS

Preconditioning

Measurement Condition

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

Calibration Department Manager

Remarks:

1. Validity of calibration area of the wind tunnel

2. Provided area within area of the tested object include mounting site

3. Diameter of mounting site

4. Size of 1

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CERTIFICATE OF CALIBRATION

MEASUREMENT RESULTS

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity is 0 m/s to 1 m/s was calculated by a standard air velocity transducer which was installed 30 mm away from wind tunnel nozzle and installed 40 mm from top of the test section and the standard air velocity is 1 m/s to 10 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 10 mm away from wind tunnel nozzle and installed 40 mm from top of the test section, UUC was mounted on a stand vertical tube of the lower plate at center of test section. The calibration was carried out under both ranging and testing air velocity in the range of 1 m/s to 10 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

1.103	23.03	24.10	6.0	-0.3	0.31
1.457	23.03	24.10	4.0	-0.2	0.31
1.67	24.08	24.10	8.0	0.00	0.31
1.69	23.00	24.10	7.0	-0.1	0.31
7.03	23.00	24.10	8.0	-0.3	0.31
8.04	23.00	24.10	9.0	-0.3	0.31
9.01	23.00	24.10	10.0	-0.3	0.31
10.94	23.78	24.10	11.0	-0.1	0.31
11.04	23.60	24.10	11.0	-0.1	0.31
13.04	23.74	24.10	11.0	-0.2	0.31
13.54	23.50	24.10	14.0	-0.1	0.31
14.68	23.60	24.10	14.0	-0.2	0.31
15.67	24.60	24.10	14.0	0.2	0.69

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preampfilter NI-24
Serial No.: 01173614 / 173176 / 74026
ID No.: NKU_F80027

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, KHUET SUAN LIANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (25.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 11 SEPTEMBER 2024
Calibration Date : 01-02 OCTOBER 2024
Date of Issue : 02 OCTOBER 2024

REVIEW BY: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 11/01/25

Calibrated by : Nattakorn Pitsupisan

Approved by : *[Signature]*
(Thaniakol Petchum)

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.

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61673-3 (2013) Standard for sound level meter (SLM).
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference
Standard Instruments.

For test results of each item 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	IEF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	IEF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY52320104	IEE-IP 21-0267	13-FEB-25
Digital Multimeter	33461A	MY52320076	IEE-IP 20-0267	15-FEB-25
Digital Multimeter	34461A	MY60034273	IEE-IP 22-0267	15-FEB-25
Programmable Attenuator	MAT-107D	62100114	IEF-0006-24	05-FEB-25
Condenser Microphone	4180	39779900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAJ	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 unusable in the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

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

[Signature]

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

[Signature]

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (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	12.0
C-weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.0 0.0 0.0 ± 1.5
1000	-0.1 -0.1 -0.1 ± 1.0
8000	-0.6 -0.5 -0.5 ± 1.0

[Signature]

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	94.1	0.1	± 0.3

[Signature]

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	34.1	0.1	± 1.1
30.0	30.3	0.3	± 1.1
29.0	29.4	0.4	± 1.1
28.0	28.6	0.6	± 1.1
27.0	27.6	0.6	± 1.1
26.0	26.9	0.9	± 1.1
25.0	26.0	1.0	± 1.1

[Signature]

Cert. No. : ACL24299
Job No. : VC67AC0158
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	30.0	30.3	0.3	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	106.0	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	106.0	106.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SHL	2	8	106.0	106.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

T. Petch

Cert. No. : ACL24299
Job No. : VC67AC0158
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Onset	136.4	136.4	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	133.1	0.1	±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	89.5	89.6	0.1
Negative one-half cycle			±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

Cert. No. : ACL24283
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0847127 / 16946 / 73461
ID No. : RVLJ50302

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHWAENG PHATHANAKAN, KHET SUAN LUANG,
BANGKOK, 10230 THAILAND.

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

Received Date : 04 SEPTEMBER 2024
Calibration Date : 19 SEPTEMBER 2024
Date of Issue : 20 SEPTEMBER 2024

Calibrated by : Nathakorn Pitsanaporn

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.

Cert. No. : ACL24283
Job No. : VC67AC0148
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	MY48017078	EP-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	UEL-BP 21-0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	UEL-BP 20-0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	UEL-BP 22-0267	15-FEB-25
Programmable Attenuator	MAT-1970	42109114	EP-0008-24	09-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-428A1	34560495	AA-3001-24	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 as :

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

T. Petch

Cert. No. : ACL24283
Job No. : VC67AC0148
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. Petch

Cert. No. : ACL24283
Job No. : VC67AC0148
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)
17.5

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

Frequency Weighting	Weighting (dB)
A-weight	12.0
C-weight	18.2
Flat	24.1

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.3	0.2	±1.5
1000	-0.2	-0.2	-0.2	±1.0
8000	-1.2	-1.1	-1.1	±5.0

T. Petch

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Job No. : VC07AC0148
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4. Electrical signal test of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.1	0.1	0.0	±1.5
250	0.1	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	0.1	±2.0
4000	0.0	0.1	0.1	±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
Lin	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

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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	135.1	0.1	±1.1
134.0	134.1	0.1	±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	33.9	-0.1	±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	30.0	30.0	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	116.9	-0.1	1.0/-2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	107.9	-0.1	1.5/-5.0
	200	800	127.6	127.5	-0.1	±1.0
	0.25	1	99.0	98.8	-0.2	1.5/-5.0
SIL	2	8	108.0	107.9	-0.1	1.0/-2.5
	200	800	128.0	128.0	0.0	±1.0

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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.8	-0.6	±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	±3.0
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	Acceptance Limits
Positive one-half cycle	Negative one-half cycle	(dB)	(dB)
89.7	89.7	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

Cert. No. : ACL24260
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0947130 / 149518 / 72364
ID No. : RYC_P8030

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
101 PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KUBIT SUAN LUANG,
BANGKOK, 10230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 1) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 09 AUGUST 2024
Calibration Date : 23 AUGUST 2024
Date of Issue : 26 AUGUST 2024

Calibrated by : Nuthakorn Pungpung

Approved by :

T. Petch
(Thakul Petchura)

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. : ACL24260
Job No. : VC07AC0148
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	MY48017976	EP-0009-24	03-FEB-25
Waveform Generator	33311B	MY32302742	EP-0007-24	03-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-HP 210267	13-FEB-25
Digital Multimeter	33461A	MY93220076	EEL-HP 200267	13-FEB-25
Digital Multimeter	33461A	MY60024273	EEL-HP 220267	13-FEB-25
Programmable Attenuator	MAT-1070	62100114	EP-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-43KAI	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 :

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

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 spread	0.2	0.3
9. Tone burst response	0.2	0.35
10. Peak C sound level	0.2	0.25
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. Petch.

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Nominal test

Measured Value (dB)
14.50000003

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

Frequency Weighting	Weighting (dB)
A-weight	9.8
C-weight	14.8
Flat	20.5

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	1.3	1.4	1.8	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-4.1	-4.0	-4.0	±5.0

T. Petch.

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±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
Long	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.

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	135.9	-0.1	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±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
26.0	26.0	0.0	±1.1
22.0	22.1	0.1	±1.1
20.0	20.1	0.1	±1.1
25.0	25.0	0.0	±1.1

T. Petch.

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	±1.3

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, T _B (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	124.0	124.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

T. Petch.

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	±3.0
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	±0.1

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

End of Calibration Certificate

T. Petch.

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NF-24
Serial No. : 00472132 / 109445 / 72466
ID No. : RYG_750304

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG 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 : 09 AUGUST 2024
Calibration Date : 30 AUGUST 2024
Date of Issue : 03 SEPTEMBER 2024

Calibrated by : Natchanon Pimpunpan

Approved by : *T. Petch.*
(Thanakul Petchai)

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.

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 Acoustic 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	IF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	IF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-RP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-RP 200367	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-RP 220367	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	IF-0008-24	05-FEB-25
Condenser Microphone	4180	2077900	AA-1001-24	13-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-1001-24	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).

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
3000 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

Result of calibration 1.

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)
16.6

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

Frequency Weighting	Weighting (dB)
A-weight	11.0
C-weight	18.0
Flat	23.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.3 0.4 0.4 ± 1.5
1000	0.1 0.1 0.1 ± 1.0
3000	0.0 0.0 0.0 ± 0.5

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
63	-0.1 -0.1 -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 0.0 ±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

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	89.1	0.1	±1.1
84.0	84.1	0.1	±1.1
79.0	79.0	0.0	±1.1
74.0	74.1	0.1	±1.1
69.0	69.1	0.1	±1.1
64.0	64.0	0.0	±1.1
59.0	59.1	0.1	±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
26.0	26.0	0.0	±1.1
24.0	24.0	0.0	±1.1
23.0	23.0	0.0	±1.1
22.0	22.0	0.0	±1.1
20.0	20.0	0.0	±1.1
18.0	18.0	0.0	±1.1
16.0	16.0	0.0	±1.1
15.0	15.0	-0.1	±1.1

Cert. No. : ACCL24264
Job No. : VC67AC9140
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	30.0	29.8	-0.2	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (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
Std.	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. : ACCL24264
Job No. : VC67AC9140
Pages : 8 of 8

10. Peak C sound level

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	±3.0
One	136.4	135.6	-0.8	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

11. Overload indication

Measured value (dB)		Deviated	Acceptance
Positive	Negative	Value	Limit
one-half cycle	one-half cycle	(dB)	(dB)
89.5	89.8	0.3	±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

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1027845 (RYO_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06290441
Issued Date: 19 September 2023
Job No.: WO-0000382
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Meanam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature 23.8 °C ± 0.4
Humidity 85.3 %RH ± 1.4

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) (Wet Chemistry)
616/10 Moo 5 T.Meanam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Nattapal Rungruang
Calibration Date: 18 September 2023
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Sigma Scientific Limited.

The standard for Wavelength Certificate No. 111563 and 111584
The standard for Photometric Certificate No. 9114864 and 111588
The standard for Stray light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

(Mr. Nattapal Rungruang)
Person in charge

(Mr. Nittun Suwan)
Authorized signatory

This certificate is issued for the sole purpose 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 expected 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 apply 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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Phone: +66 2453 8331 Email: info@dksh.com Website: www.dksh.com

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CAL/FM-C06-16: 12 Sep 2023



Certificate No.: C06290441 Page 2 of 3

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm)	The spectral bandwidth of filter at 2 nm and UVC at 2 nm	Correction	Uncertainty
418.81	418.3	0.51	0.13
536.86	536.6	0.26	0.13
637.98	638.3	-0.32	0.13
748.48	748.7	-0.22	0.13
807.03	807.4	-0.37	0.13

Photometric Accuracy (Absorbance)	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0040
	0.2500	0.259	0.0040	0.0040
	0.5168	0.519	-0.0022	0.0040
	1.0298	1.029	0.0006	0.0040
	0.0000	0.000	0.0000	0.0040
440 nm	0.2867	0.283	0.0037	0.0040
	0.6073	0.609	-0.0017	0.0040
	1.0063	1.007	-0.0013	0.0040
	0.0000	0.000	0.0000	0.0040
480 nm	0.2516	0.250	0.0016	0.0040
	0.4560	0.462	-0.0025	0.0040
	0.9324	0.933	-0.0004	0.0040
	0.0000	0.000	0.0000	0.0040
546.1 nm	0.2461	0.245	0.0011	0.0040
	0.4652	0.466	-0.0008	0.0040
	0.9468	0.946	0.0008	0.0040
	0.0000	0.000	0.0000	0.0040
590 nm	0.2594	0.259	0.0004	0.0040
	0.5040	0.506	-0.0010	0.0040
	1.0032	1.002	0.0012	0.0040
	0.0000	0.000	0.0000	0.0040
635 nm	0.2579	0.257	0.0009	0.0040
	0.4971	0.497	0.0001	0.0040
	0.8720	0.871	0.0010	0.0040

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CAL/FM-C06-16: 12 Sep 2023



Certificate No.: C06290441 Page 3 of 3

Calibration Results:
Without Adjustment

Photometric Accuracy (Absorbance)	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7398	0.737	-0.0015	0.0080
287 nm	0.0000	0.000	0.0000	0.0080
	0.8874	0.887	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2884	0.290	-0.0008	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.8374	0.837	0.0004	0.0080

Stray light *	UVC: Wavelength (nm)	UVC: Transmission (%)	Absorbance (A)
Standard: out-off	260.62 ± 0.11 nm	260.6	1.3
	391.44 ± 0.11 nm	391.4	1.3

Spectral Resolution *	Peak	Trough	Ratio	SRW
Nominal Concentration 0.02 % w/v	266.66	266.66	1.38	2.00
UVC: Wavelength (nm)	268.2	268.1		
Std Absorbance (A)	0.4966	0.2760		
Absorbance (A)	0.413	0.300		

* Calibration Marked * Not TIB Accredited * in this Certificate have been included for completeness.

The End of Certificate

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CAL/FM-C06-16: 12 Sep 2023



ใบตรวจสอบสภาพเครื่องวัดรังสีแสง

ชื่อเครื่องวัด: SPECTROPHOTOMETER รุ่น: DR6000
เลขที่ใบงาน: WO-0000382
หมายเลขเครื่อง: 1027845

ตรวจสอบ (ข้อ)		รายการตรวจสอบ	ตรวจสอบ (ข้อ)		หมายเหตุ
18 Sep 2023			18 Sep 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input type="checkbox"/>	<input type="checkbox"/>	1. ความสะอาดเครื่อง	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในเครื่อง)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ On - (On-Off Switch)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input type="checkbox"/>		
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	7. ควบคุมความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>		*
<input type="checkbox"/>	<input type="checkbox"/>	9. เวลาเปิดเครื่อง (UV < 3,000 hour)	<input type="checkbox"/>		9.2 Hours
<input type="checkbox"/>	<input type="checkbox"/>	10. เวลาเปิดเครื่อง (Visible < 5,000 hour)	<input type="checkbox"/>		741.5 Hours
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องใส่ตัวอย่าง (Cuvette Module)	<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"/>	13. ระดับสารละลาย Electrode (Level KCl)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>		
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่น (No Sample)	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	17. ระบบการวัดความขุ่น (>= 2.5 หน่วย 3.0)	<input type="checkbox"/>		
Automatic diluter					
<input type="checkbox"/>	<input type="checkbox"/>	18. สาย Piston Burettes	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบการผสมสารละลายอัตโนมัติ	<input type="checkbox"/>		

ผลการตรวจสอบ: 100% Pass=856.1nm
1485.0nm=485.0nm

Mr. Nattapal Rungruang
Service Engineer

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CAL/FM-R01-03: 20 Jul 2023

[illegible]

Certificate No. T241120

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 11 June 2024
Environment : Temperature : 23.1-24.1 °C
Line Voltage : 222.3-226.3 V
Relative Humidity : 55-65 %RH

Condition of this result of calibration :

- This equipment was calibrated by insert nine standard thermocouples type T into the chamber, the other one standard thermocouple type T was for ambient temperature measurement. The calibration was done in accordance with W1720 (based on ASTM E145-91 / Reapproved 2001) and AS2853-1986.
- All data above were final values and the initial data from customer request. The temperature scale used was based on ITS-90.

5. Reference Standard Instrument

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYW17	TN161-TN170	T240711	19 April 2025
TC	TYW17	TN171-TN180	T240711	19 April 2025
DATA LOGGER	14070A	T145	T240711	19 April 2025

- This certificate is traceable to National Institute of Metrology (Thailand) through Metrology Center (NIST-TN1-FIS 17025 CALIBRATION) (NIST)

4. Condition of calibrated item : good

Equipment Description :
Type Control : ☐ On ☐ Off ☐ Manual ☐ Auto ☐ Stop
Pneum Air Hanger : ☐ On ☐ Off ☐ Manual ☐ Stop
☒ Not Available

7. Adjustment

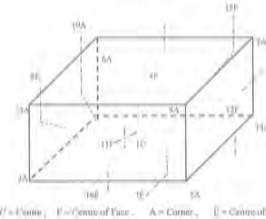
() Without adjustment

Approved By :

Certificate No. T241120

Page 3 of 4

Calibration Report



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

Approved By :

Certificate No. T241120

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
3	2.73	2.70	2.77	2.76	2.99	3.31	3.00	3.21	3.08	3.00
	TN171	TN172	TN173	TN174	TN175	TN176				
	3.29	3.01	2.92	2.81	3.42	3.40				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Repeatability (±°C)	Coverage Factor #
	Min	Max					
3.0	2.9	3.4	3.2	0.07	1.32	1.13	2.00

* The guard uncertainty exclude " uniformity "

The calibration result apply only to the actual calibrated item.

The result of one year found previous to shown on this end page of one only.

The instrument equipment uncertainty is based on 1 standard uncertainty multiplied by 2 coverage factor (which for 4 standard uncertainty)
a level of confidence of approximately 95 %

Approved By :

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
334 PATTANAKARN ROAD BOX 15, BANGSUANG, BANGSUANG BANGKOK 10250
TEL. 0-2315-3000 FAX. 0-2319-9484

Cert.No.: 23TW108
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 21 July 2023
Test Date : 24 July 2023
Reference : 2307-071308C-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng,
Rayong 21140, 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 : Waleek Sornthuan
Approved by :
Approved Signatory

() Malee Butkruea
() Sathip Meangmat
() Wankorn Lemgagrakul

Issue Date : 26 July 2023

B 0320211

Cert.No.: 23TW108
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	23CO1172	22 Mar 2025
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No. : 15E100454

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.17	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concern intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory.

-00-

B 1172155

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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334 PATTANAKARN ROAD BOX 15, BANGSUANG, BANGSUANG BANGKOK 10250
TEL. 0-2315-3000 FAX. 0-2319-9484

Cert. No.: 23LM125
Page: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng,
Rayong 21140, Thailand

Location : TPA On Site Calibration Laboratory

Received Order : 26 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Prascha Hahb
Approved by :
Approved Signatory

() Pornthippa Taneyakul
() Malee Butkruea
() Suwit Injai

Issue Date : 31 July 2023

The Uncertainty are for a confidence probability of approximately 95 %
This certificate may be re-examined after date is fully agreed with the user version.
Approved by the head of Corporate Services 3 : Equipment Calibration and Testing Services

A 0053616

Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-071305C-2
Page: 2 of 2

Cert. No.: 23LM125

Calibration was 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	2180083	221285	TPA	21 Oct 2023

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

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

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

Result of Calibration:- (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, SN: 1228476387

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	100	20.011	19.91	-0.101	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 %.

-000-

1159515

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

Cert. No.: 24TM1663
Page: 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V618.0084

ID No. : RYG_EN0154

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
61610 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

Location : BOD Room

Received Order : 01 November 2024
Calibration Date : 01 November 2024
Ambient Temperature : (20 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee

Approved by : Kunchit Promrat

Issue Date : 07 November 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 : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Page: 2 of 3

Cert. No.: 24TM1663

Calibration was 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	MY44073381	24LM73	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

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221

Position : Ref. Std. ID No.:

1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09

Probe Installation Details : Dimension of Chamber :

a = 10 cm D = 0.60 m
b = 10 cm W = 1.0 m
c = 10 cm H = 1.2 m
Capacity = 0.72 m³

Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Page: 3 of 3

Cert. No.: 24TM1663

Calibration was conducted using in-house calibration procedure CP-OT01 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 standard instruments :-

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A7A609	231245	19 Oct 2024
2) Industrial Platinum Resistance Thermometer	5627-12	571975	231245	19 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 maintained through:-

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

Calibrated by : Yossapan Palom
Issue Date : 10 October 2024

Approved Signatory : Phalinee Prabpaipal
Chatchawan Khurpluek
Wanlop Larpkern

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert. No.: 24TM1663
Page: 1 of 2

Equipment : Digital Thermometer With Sensor

Manufacturer : Testo

Model : 106

Serial No. : 31129895/202

ID No. : RYG_FS0498

Condition As-Received : Used Item

Received Date : 30 September 2024

Calibration Date : 08 October 2024

Reference : 2409-1061DISC

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (50 ± 20) %

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
61610 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

Procedure used: Calibration was conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (PRT) 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) Digital Thermometer	1529	A7A609	231245	19 Oct 2024
2) Industrial Platinum Resistance Thermometer	5627-12	571975	231245	19 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 maintained through:-

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

Calibrated by : Yossapan Palom
Issue Date : 10 October 2024

Approved Signatory : Phalinee Prabpaipal
Chatchawan Khurpluek
Wanlop Larpkern

Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Page: 2 of 2

Cert. No.: 24TM1663

Calibration was 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	MY44073381	24LM73	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 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	25.0064	25.0	-0.0064	0.12
50	30.0031	29.9	-0.1031	0.12
50	40.0048	40.0	-0.0048	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%.

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Cert.No.: 23CH1088
Page: 1 of 2

Certificate of Calibration

Equipment: Conductivity Meter
Manufacturer: Mettler Toledo
Model: 8230
Serial No.: B241407147
ID No.: RYG_EN0029
Condition As-Received: Used Item
Received Date: 01 September 2023
Calibration Date: 04 September 2023
Reference: 2308-0110DSC-3
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH6 based on direct measurement by using certified reference material (CRM)

Calibrated by: Warakorn Lemgagrakul

Approved by:
(✓) Sathip Meangma
() Warakorn Lemgagrakul
(✓) Porpan Pajum

Issue Date: 7 September 2023

The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced unless prior to full change with the previous version.
Approval of the Result of Corporate Services & Equipment Calibration and Testing Services.

A 0058059



Cert.No.: 23CH1088
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instrument
Instrument Serial No. ID No. Certificate No. Due date
1) Thermometer 9649224 130RC003 23435 10 Apr 2024
- This Calibration is traceable to SI Through Technology Promotion Association (Thailand - Japan)
- Certified Reference Materials
- Conductivity calibration solution, CPA Chem Ltd. The measurement results are traceable to SI through CPA Chem Ltd., ANS-ASQ National Accreditation Board, Accredited No. AR-1835
Conductivity Solution Manufacturer Lot No. Exp. date
84.800 µS/cm CPA Chem 880120 28 Mar 2024
1413.0 µS/cm CPA Chem 913596 14 July 2024
12.880 mS/cm CPA Chem 880123 28 Mar 2024
- Control Conductivity calibration solution temperature by Water bath (25.0 ± 0.1) °C
3. This certificate is valid only to the item calibrated on date and place of calibration.
Calibration Results
Function: Conductivity Measurement
(*) After Adjustment at 1413.0 µS/cm
Conductivity Electrode Serial No.: 5823251000

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (k)	Coverage factor k
84.000 µS/cm	83.8 µS/cm	85.3 µS/cm	0.02 µS/cm	2.00
1413.0 µS/cm	1388 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.41 mS/cm	12.63 mS/cm	0.066 mS/cm	2.00

Remark: - UUC* = Unit Under Calibration
- Cell constant = 0.545371 cm⁻¹

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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Sathip

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Certificate No.: 23CH104
Page: 1 of 2

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenCompact
Serial No.: B034291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 14 December 2023
Reference: 2312-0110DSC-3
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand

Procedure used: Calibration was conducted using calibration procedure No. GP-217 according to SI (BAMET) eq. 11.

Condition of this result of calibration

- Reference Standard Instruments
1) Multi-Product Calibration
Instrument Model Serial No. Certificate No. Due Date
2302A 245002 K6-0041-23 28 Apr 2024
3 This result of calibration was made on request at the party specified in the certificate.
4 The certificate is valid only to the item calibrated on date and place of calibration.
5 This Calibration is traceable to the International System of Unit maintained through:
National Institute of Metrology Thailand (NIMT)

REVIEW BY: N. Bannai
APPROVED BY: Sathip
NEXT CAL. DATE: 14 Dec 2024

Calibrated by: Warakorn Lemgagrakul
Issue Date: 15 December 2023
Approved Signatory:
() Porpan Pajum
(✓) Sathip Meangma
() Warakorn Lemgagrakul

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Cert. No.: 23CH1024
Page: 2 of 2

Result of calibration: (*) Without adjustment () After adjustment

Function: DC voltage measurement

Function:	DC voltage measurement	Range	2000	mV	
	Standard Value	UUC* Reading	Error		Uncertainty
	(mV)	(mV)	(mV)		(mV)
	-200.0000	-198.9	0.1		88
	-150.0000	-150.0	0.0		85
	-100.0000	-100.0	0.0		83
	-50.0000	-50.0	0.0		81
	0.0000	0.0	0.0		88
	50.0000	50.0	0.0		91
	100.0000	100.0	0.0		93
	150.0000	150.0	0.0		95
	200.0000	199.9	-0.1		98

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

UUC* = Unit Under Calibration.

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Cert.No.: 23CH1074
Page: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenCompact
Serial No.: B034291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 15 December 2023
Reference: 2312-0110DSC-3
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH6 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH6 by comparison with standard buffer solution

Calibrated by: Warakorn Lemgagrakul

Approved by:
() Sathip Meangma
() Warakorn Lemgagrakul
(✓) Porpan Pajum

Issue Date: 18 December 2023

The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced unless prior to full change with the previous version.
Approval of the Result of Corporate Services & Equipment Calibration and Testing Services.

A 0061886



Cert.No.: 23CH1011
Page: 2 of 2

Condition of this calibration result

- Reference Standard Instrument
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 2362609 27 Aug 2024
2) Ref. Standard Thermometer 4982054 110FC044 236068 28 July 2024
- This calibration is traceable to the International System of Unit maintained through:
Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials The measurement results are traceable to SI through CPA Chem Ltd., ANS-ASQ National Accreditation Board, Accredited No. AR-1835
Buffer Solution Manufacturer Lot No. Exp. Date
pH 4.009 CPA Chem 813596 14 July 2025
pH 6.860 CPA Chem 831980 01 Oct 2024
pH 8.987 CPA Chem 840108 02 Nov 2024

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

Calibration Results
Function: mV Measurement
Performing standard curve by Fluke at pH (4.7, 10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
	pH	mV	mV	(mV)	k
pH Meter	4.000	-177.48	-177.3	4.000	3.00
B/N: B034291445	7.900	6.00	4.1	7.000	3.00
	10.000	-177.48	-177.5	10.000	2.00

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Certificate No. T240742

Page 3 of 5

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block											
°C	°C	°C	Reading	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C
380.0	380.0	379.2 - 380.1		379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7

Approved By: *[Signature]*

FM-1.13 08/30-05/37

Certificate No. T240742

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Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block											
°C	°C	°C	Reading	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C
380.0	380.0	379.2 - 380.1		379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7

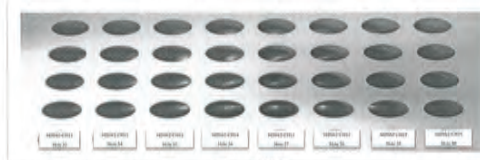
Approved By: *[Signature]*

FM-1.13 08/30-05/37

Certificate No. T240742

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Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block											
°C	°C	°C	Reading	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C	Max °C	Min °C	Average °C	Stability °C
380.0	380.0	379.2 - 380.1		379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7
				379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7	379.2	379.9	379.5	0.7

Approved By: *[Signature]*

FM-1.13 08/30-05/37

The expanded uncertainty of temperature measurement was $\pm 1.87^\circ\text{C}$.
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=1, providing a level of confidence of approximately 95 %.

Maintenance Plan YEAR : 2024

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

Periodical maintenance check list for Konelab

- Diluent/wash tubing change
- ISE tubing change
- Syringe check/change
- Dispensing check/ change
- Waste tubing change when necessary
- Lamp check/change
- Motor paddle/paddle change(not Konelab20)
- ISE needles check/change
- Pump tubing check/ change
- Breakdown/warm out part check (change)
- Peristaltic pump check (cleaning) lubrication
- Heating check
- Cooling check
- Dispenser mechanic check/adjustment
- Cuvette transfer mechanic check/adjustment
- Dispenser movement check/adjustment
- Sample/reagent reader check/adjustment
- Dispensing tubing/titration check
- Photometer and optics cleaning/check/adjustment
- Workstation PC cleaning if necessary
- Mechanic cleaning/maintenance
- Instrument cleaning if necessary
- Complete analyzer testing with water/blank/QC or sample
- Test parameters/Adjustment/config. Save to USB key
- UPS Test

Place: *[Signature]* Instrument: *[Signature]*
Date/Time: 2024/01/01 Serial no: 20240101
Service date by: *[Signature]* Install date: *[Signature]*
Signature of customer: *[Signature]* Date/Time: *[Signature]*

Certificate of Calibration

Certificate No. BSOC-UV-37424
Equipment UV-1800
Model UV-1800
Manufacturer Shimadzu
Serial No. A1145006633 CD
ID No. BKK_EN0018
Date of receipt 13 September 2024
Date of calibration 13 September 2024
Date of issue 13 SEP 2024

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 W-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. 106384 and 111308
Stray Light is traceable to certificate No. 106377
The above certificate are traceable to SI unit through Strata Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0699)

Calibrated by Mr. Wanchana Janloy

Approved by

[Signature]
Mr. Sorith Temboonakul
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.

Certificate of Calibration

Certificate No. BSOC-UV-37424
Number of Page(s) 2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
241.29	241.29	-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)
245	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
	0.6195	0.6194	-0.0005	0.0075

*CNR = Customer not request

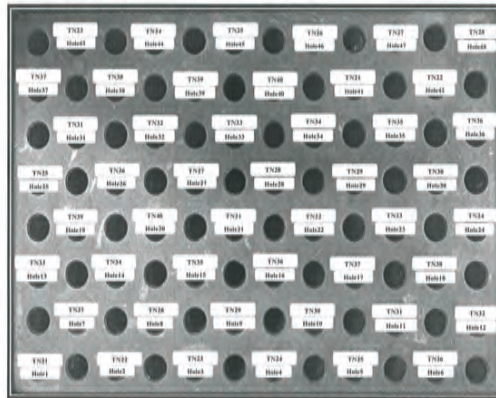
The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
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FM-UV-708-02 Rev.01 (2019/03)

Certificate No. T231676

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By: _____

TM-L11 08/30-05-57

Certificate No T231676

Page 4 of 6

Calibration Report

Measurement Results		Average Standard Reading at each position (°C)									
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
R1 Hole1-Hole6	Max	95.01	94.41	95.20	95.41	94.51	95.17				
	Min	94.57	93.95	94.75	94.92	94.00	94.72				
	Average	94.79	94.18	94.98	95.17	94.26	94.95				
R2 Hole7-Hole12	Max	95.36	95.43	95.19	95.16	95.33	94.97				
	Min	94.94	94.93	94.72	94.71	94.90	94.97				
	Average	95.15	95.19	94.96	94.94	95.13	94.97				
R3 Hole13-Hole18	Max	95.37	95.50	95.22	95.21	95.33	95.21				
	Min	94.99	95.06	94.78	94.82	94.88	94.96				
	Average	95.18	95.30	95.00	95.02	95.11	95.13				
R4 Hole19-Hole24	Max	95.39	94.42	94.52	94.24	94.63	94.67				
	Min	95.21	94.06	94.13	93.88	94.28	94.27				
	Average	95.40	94.24	94.33	94.06	94.45	94.47				
R5 Hole25-Hole30	Max	95.13	95.28	95.43	95.20	95.18	95.43				
	Min	94.87	95.03	95.26	94.95	94.79	94.70				
	Average	95.01	95.20	95.35	95.12	94.96	94.97				
R6 Hole31-Hole36	Max	94.63	94.90	94.77	94.51	94.24	93.87				
	Min	94.24	94.55	94.44	93.98	93.82	93.56				
	Average	94.43	94.72	94.60	94.24	94.03	93.71				
R7 Hole37-Hole42	Max	94.20	94.44	94.04	93.81	93.89	93.31				
	Min	93.62	94.03	93.47	93.48	93.29	94.00				
	Average	94.13	94.24	93.86	93.65	93.54	93.73				
R8 Hole43-Hole48	Max	95.99	95.63	95.28	95.29	95.43	94.87				
	Min	95.37	95.15	94.82	94.84	94.99	94.49				
	Average	95.78	95.39	95.05	95.07	95.21	94.68				

Approved By: _____

TM-L11 08/30-05-57

Certificate No T231676

Page 5 of 6

Calibration Report

Measurement Results		Average Standard Reading at each position (°C)									
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
R1 Hole1-Hole6	Max	105.23	104.12	105.43	105.25	104.44	105.27				
	Min	104.94	103.89	105.13	105.04	104.11	104.96				
	Average	105.09	104.13	105.29	105.15	104.28	105.13				
R2 Hole7-Hole12	Max	105.30	105.12	105.18	105.22	105.12	104.97				
	Min	105.11	104.92	104.96	105.00	104.92	104.97				
	Average	105.20	105.02	105.07	105.11	105.02	104.96				
R3 Hole13-Hole18	Max	105.27	105.63	105.02	104.80	104.69	105.19				
	Min	105.17	105.27	104.75	104.70	104.70	105.00				
	Average	105.22	105.30	104.88	104.60	104.60	105.09				
R4 Hole19-Hole24	Max	105.31	104.43	104.41	104.71	105.63	105.83				
	Min	105.08	104.22	104.15	104.41	105.37	105.56				
	Average	105.19	104.33	104.28	104.56	105.50	105.69				
R5 Hole25-Hole30	Max	104.95	104.26	104.74	105.59	104.87					
	Min	104.67	103.96	103.08	103.36	103.64					
	Average	104.81	104.11	103.91	104.47	104.26					
R6 Hole31-Hole36	Max	104.75	104.66	104.80	105.20	104.30	104.39				
	Min	104.54	104.63	104.59	105.00	104.32	104.18				
	Average	104.65	104.75	104.69	105.10	104.31	104.28				
R7 Hole37-Hole42	Max	104.30	104.99	104.83	104.63	104.88	104.83				
	Min	104.09	104.72	104.66	104.49	104.63	104.52				
	Average	104.19	104.85	104.75	104.56	104.76	104.68				
R8 Hole43-Hole48	Max	105.71	105.83	105.19	105.61	105.42	105.19				
	Min	105.45	105.61	105.14	105.27	105.18	104.84				
	Average	105.58	105.73	105.27	105.44	105.30	105.07				

Approved By: _____

TM-L11 08/30-05-57

Certificate No. T231676

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Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (°C)	Uncertainty (°C)
	Min.	Max.		
100.0	100.3	100.5	0.20	0.01
107.0	107.0	107.1	0.10	0.78

* The quoted uncertainty exclude "uniformity".

The calibration result apply only the above calibrated item.

The result of test was found accurate in shown on data and place of uncertainty.

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

Approved By: _____

TM-L11 08/30-05-57

Certificate No. T231676

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)
Manufacturer : KOLITECH
Model : KM 320
Serial No. : TBN-101206/03
Customer Code : BKK_EN0157
ID No. : T2463A3
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasarn 40, Phatthanasarn Rd., Klongkarn Phatthanasarn,
Khet Suan Luang, Bangkok 10250
Customer Location : Laboratory
Date of Receipt : 29 November 2023
Calibrated By : Atipong Rongrat (Technician)
Approved By : _____ Doonchai Suriyayong (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.

TM-L11 08/30-05-57

Certificate No. T231676

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 : 231.4-238.2 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 accordance to WI-Y20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1995). All data above below were final values and the initial data from customer report. The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Exp Date
TC TYPH-T TN161-TN170 T210771 10 April 2024
TC TYPH-T TN171-TN180 T210772 10 April 2024
DATA LOGGER 34970A T140 T220775 10 April 2024

3. This certificate is traceable to : National Institute of Metrology (Thailand) through Metrological Center (SCI ECO SERVICES COMPANY LIMITED)

4. Condition of calibrated item : good

Equipment Description :
Type Constant : 1 Hour
Fillet Air Damper : ☐ Open ☐ Min. ☐ Medium ☐ Max.
☐ Clear ☒ Not Available

% Adjustment : (X) without adjustment () with adjustment

Approved By: _____

TM-L11 08/30-05-57

Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2307-0285OC-3
Result of Calibration : [*] Without Adjustment
Function of UUC* : Temperature Source

Operating parameter Set : Temperature = 121 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121	121	1	120.877				
		2	120.870	0.38	0.12	1.0	2
		3	120.886				

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 %.

1159504

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5345 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10550
TEL.9-2713-9880-29 FAX.9-2719-8484

Cert. No.: 23TM1140
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : SHEL-LAB
Model : 1015A
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 : 17 July 2023
Calibration Date : 17 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanasongsaiboon

Approved by : [Signature]
() Ponthipha Taneyakul
(x) Man Bhubrua
() Suwit Injai

Issue Date : 24 July 2023

The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0056489

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0285OC-1
Procedure Used : Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

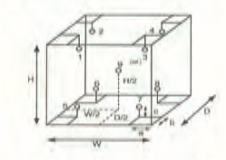
Cert. No.: 23TM1140
Page : 2 of 3

Certificate of Calibration

Condition of this result of calibration
1. Reference standard instrument:-
Instrument **Serial No.** **Cert. No.** **Traceable** **Due Date**
1) Data Acquisition MY49001451 23LM27 TPA 25 Feb 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 of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL Humid. (%)	54	56
AC Supply (Volt)	221	223



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

Probe Installation Details :
a = 10 cm D = 0.50 m
b = 10 cm W = 0.75 m
c = 10 cm H = 1.2 m
Capacity = 0.45 m³

1172189

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0285OC-1
Result of Calibration : [*] Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM1146
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	0.055	0.30	0.44	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.808	34.833	34.815	34.813	35.004	35.019	35.156	35.141	35.087	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 %.

1172188

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5345 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10550
TEL.9-2713-9880-29 FAX.9-2719-8484

Cert. No.: 24TM667
Page : 1 of 3

Certificate of Calibration

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 : [Signature]
() Ponpan Palgim
(x) Suwit Injai
() Kunchit Promprat

Issue Date : 26 April 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 & Equipment Calibration and Testing Services.

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

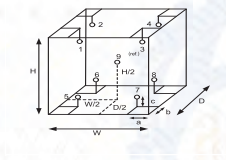
Cert. No.: 24TM667
Page : 2 of 3

Certificate of Calibration

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	25
REL Humid. (%)	65	65
AC Supply (Volt)	223	222



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

Probe Installation Details :
a = 10 cm D = 0.50 m
b = 10 cm W = 0.80 m
c = 10 cm H = 0.60 m
Capacity = 0.24 m³



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 k
180	180	180	0.64	2.7	3.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
6344 PATTANAKARN ROAD BDI 18, SUAN LUANG, SUAN LUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2718-9484



Certificate of Calibration

Cert. No.: 24TM469
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Mamert
Model : WNE 45
Serial No. : L712.0429
ID No. : BKK_ML0056

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

Received Order : 01 March 2024
Calibration Due : 01 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Kridsa Malee

Approved by :
() Pomthipha Taneyakul
() Unnopphol Harachal
✓ Suwit Injai

Issue Date : 4 March 2024

The uncertainties are not 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 : 2403-0001OC-1
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 23LM115 TPA 11 Jul 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)

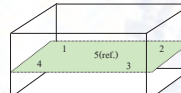
Result of Calibration : (*) Without Adjustment

Function of UUC : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply	
	(°C)	(%R.H.)	(Volt)	
Beginning of Calibration	24	55	221	
Finished of Calibration	23	56	220	

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



Front



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0001OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC : Temperature Source

Cert. No.: 24TM469
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	44.469	44.462	44.492	44.510	44.496	0.15
45.0	45.0	45.0	44.975	44.974	45.007	45.023	44.999	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.087	0.029	2
45.0	0.089	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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BKK_EL0037



Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance



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

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

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



ICP-OES adjustment

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

Record Post-PM instrument performance

- ☒ Run Instrument Performance test
- ☒ Record results in Instrument Performance Test Results Table - Post-PM
- ☒ For systems using ICP Expert version 7.3 and above, run the following instrument tests:
 - ☒ Subsystem Communications Test
 - ☒ Air Flow
 - ☒ Water Flow
 - ☒ Gas Flows
 - ☒ RF Generator
 - ☒ Camera Test
 - ☒ Optics Test
 - ☒ Nebulizer Test

- ☒ Record the result in the Instrument Test Results Table

Restore Instrument

- ☒ For HP applications, ask the customer to reinstall their sample introduction system.
- ☒ Leave system in an idle state on and purging.
- ☒ Outsource: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review the service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.

Test Results

Instrument Performance Test Results Table

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

	Pre-PM Sensitivity Check		Post-PM Sensitivity Check	
	Initial	Actual *	Initial	Actual*
Zn 213.852 nm (ppb)	1511.1	2146.3	1510.0	2141.1
Mn 279.482 nm (ppb)	2551.1	1930.6	2145.3	1939.3
Al 396.152 nm (ppb)	1.2	16.0	5.4	16.9
K 766.491 nm (ppb)	5.3	64.0	9.6	92.2

* Actual result is not applicable for G8010AA, G8012AA Radial View instruments.

Instrument Test Results Table

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

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

ICP-OES Status Results Table

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

Measurement	Steady State	Plasma On
Main Voltage	219.35 V	215.18 V
Main Current	0.0% A	0.17 A
Instrument Temperature	11.5 °C	13.0 °C
RF Air Flow (Normal Speed)	90.0 SLPM	89.0 SLPM
Plasma Exhaust Temperature	No measurement	50.1 °C
Water Flow (Normal)	No measurement	1.10 L/min
Water Flow (Detector)	1.16 L/min	1.05 L/min
Water Inlet Temperature	21.8 °C	18.6 °C
RF/Plasma Temperature	35.0 °C	36.0 °C
ICP Temperature	16.1 °C	16.0 °C
Thermal Stability	0.1 %	0.1 %
Argon Supply Pressure	0.76 MPa	0.61 MPa
Purge Gas Supply Pressure(1)	0.10 MPa	0.14 MPa
Exhaust Gas Supply Pressure(1)	— MPa	— MPa
Nebulizer Flow	No measurement	0.10 L/min
Nebulizer Back Pressure	No measurement	2.14 MPa
Plasma Gas Flow	No measurement	1.05 L/min
Auxiliary Gas Flow	No measurement	1.05 L/min
RF Power	No measurement	1500 W
RF Supply Current	No measurement	1.66 A
RF Supply Voltage	No measurement	16.0 V

(1) If option installed

Consumed PM Parts

Part Description	Part Number	Product or Module where used	Quantity consumed
Acid Pre-Dilution Valve	08010-00011	G8010A, G8011A, G8012AA/G8012A	1
Sample Injection Valve	08010-00010	AP	1
Agilent Cold Chex Cooled Fluid	0799-0007	Agilent Water Management	1
Purge Gas Filter	08010-00189	AP	1
Air Inlet Filter	08000-08000	AP	1
High Capacity Air Filter	08010-00189	Optional	—
Water seal for 6.7 part valve for APMS/7	08094-00007	G8094A/G8095	—
Water seal for 4 part valve for APMS/7	08093-00007	G8093A	—
Water solution to clean injection 2.0mm ID x 7mm	08010-00123	SPS A	1
Quick Connection 5 Series 3 Series ID	08010-00134	SPS A	1
ICP waste tubing (removed 4 Series 42.0cm)	08010-00192	SPS A	1
Additional Parts may be required from engineer's stock			
Acid drive belt	5410047000	SPS B	—
Acid drive belt	5410047000	SPS B	—
Peristaltic pump tubing (PVC) 3/16" ID x 3/16" OD	371000000	SPS A	—

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

- ☒ Section Not Applicable

Part Description	Part Number	Product or Module where used	Quantity consumed
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Signature Page

Service Engineer Comments (optional)

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

Service Verification

Service Request Number: 6011111111
 Service Engineer Name: *John J. J. J.*
 Service Engineer Signature: *John J. J. J.*
 Total number of pages in this document: 11

Date Service Completed: Feb 21, 2020
 Customer Name: *John J. J. J.*
 Customer Signature: *John J. J. J.*



Cert. No.: 23TM1400
Page: 1 of 4

Certificate of Calibration

Equipment: Autoclave

Manufacturer: TOMY

Model: SX-700

Serial No.: 48134180

ID No.: BKK_ML0041

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

Location: Media Preparation Room

Received Order: 03 October 2023

Calibration Date: 04 October 2023

Ambient Temperature: (28 ± 10) °C

Relative Humidity: (60 ± 30) %

Calibrated by: Khl Rutanaprasachai

Approved by:
Approved Signatory

() Pannipha Tamayakul
(✓) Ponpan Palgan
() Suwit Injai

Issue Date: 11 October 2023

The Uncertainty is for a confidence probability of approximately 95 %

This certificate may not be reproduced without the prior written consent of the Association of Corporate Services & Equipment Calibration and Testing Services.

A 0059272



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0080C-6
Page: 2 of 4

Procedure Used :-

Calibration was conducted using in-house calibration procedure CP-0103 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

- Reference standard instrument.
- Instrument: MYD7013823 23LM6 TPA 28 Mar 2024
- 1.) Data Acquisition
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certificate is traceable to the International System of Unit.
- This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

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

Result of Calibration: (°) Without Adjustment

Function of UUC*: Temperature Source



	Environmental		
	(°C)	(%RH)	(VBR)
Beginning of Calibration	26	64	221
Finished of Calibration	27	67	222

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	19-17TC-08
2 =	Temperature sensor	19-17TC-09
3 =	Exhaust port	19-17TC-10

1184533



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0080C-6
Page: 3 of 4

Result of Calibration: (°) Without Adjustment

Function of UUC*: Temperature Source

Operating parameter Set: Temperature = 108 °C		Sterilization period = 10 minute		Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor K
UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)				
108	108	1	108.352	0.12	0.04	0.90	2
		2	108.263				
		3	108.140				

Operating parameter Set: Temperature = 115 °C		Sterilization period = 20 minute		Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor K
UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)				
115	115	1	115.376	0.13	0.08	0.90	2
		2	115.297				
		3	115.157				

Operating parameter Set: Temperature = 118 °C		Sterilization period = 10 minute		Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor K
UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)				
118	118	1	118.063	0.11	0.09	0.90	2
		2	118.037				
		3	117.954				

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.

1184532



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0080C-6
Page: 4 of 4

Result of Calibration: (°) Without Adjustment

Function of UUC*: Temperature Source

Operating parameter Set: Temperature = 121 °C		Sterilization period = 30 minute		Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor K
UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)				
121	121	1	121.188	0.17	0.11	0.91	2
		2	121.082				
		3	120.960				

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.

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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1184531

ภาคผนวก จ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

(๓๓๔) นายอนันต์ชัย,

- ๓๓๙) นายอินทชัย วิเศษ
- ๓๔๐) นายวรวุฒิ ศักดิ์
- ๓๔๑) นายแสงตะวัน นะตะสี
- ๓๔๒) นายอุทพงษ์ จันทะ
- ๓๔๓) นายชัยวุฒิ ไชยชนะกิจ
- ๓๔๔) นายวิศุทธิ์ ศิริธรรมมา
- ๓๔๕) นายทนทกร เชื้อทอง
- ๓๔๖) นายเกียรติ สุทธะ
- ๓๔๗) นางสาวณัฐภรณ์ บุญชัย
- ๓๔๘) นางสาวจิรพันธ์ แสนสี
- ๓๔๙) นายไพรัช เปี่ยมพิทยา
- ๓๕๐) นางสาวศุภมาศ ขอมมาก
- ๓๕๑) นางสาวสิริภา จิตสว่าง
- ๓๕๒) นางสาวนิภา เทียนอุทัย
- ๓๕๓) นางสาวกัญติมาพร คำนีมน
- ๓๕๔) นางสาวสุกัญญา ภาณุภูมิ
- ๓๕๕) นางสาวไพรินทร์ ศรีภูมิ
- ๓๕๖) นางสาวทิพย์พร แซ่ลือ
- ๓๕๗) นางสาวสอาด ปานทอง
- ๓๕๘) นางสาวอริสา ทองพล
- ๓๕๙) นางสาวอรุณฯ คำคือ
- ๓๖๐) นางสาวศุภกานันท์ สุนทรสนาน
- ๓๖๑) นางสาวอัญชลี ศักดิ์
- ๓๖๒) นายบุญฤทธิ์ เอี่ยมทอง
- ๓๖๓) นางสาวศุภรดา เปี่ยมญา
- ๓๖๔) นางสาวพาดิษฐ์ คุณานัน
- ๓๖๕) นางสาวจิราธิชา พงศ์
- ๓๖๖) นางสาวอารยา นิธิ
- ๓๖๗) นางสาววิรัชชา นาคสุข
- ๓๖๘) นางสาวนันทิยา จันทร์อุ
- ๓๖๙) นายศักดิ์พงษ์ แซ่
- ๓๗๐) นายอนุชิต ภูอภิ
- ๓๗๑) นายวิพล แสนทอง
- ๓๗๒) นายศักดิ์พิชญ์ บุญ
- ๓๗๓) นายสุวิวัฒน์ แซ่
- ๓๗๔) นายนิพนธ์ ศรีวิรินทร์
- ๓๗๕) นางสาวอัมมวรรณ ส่วนสย
- ๓๗๖) นางสาวณัฐพร สิง
- ๓๗๗) นางสาวเนตร แซ่

๑๕๓) นางสาวอุบล

- ๑๕๓) นางสาวอุบล เป็กศิริ
- ๑๕๔) นางสาวนงนรินทร์ ทองบุตร
- ๑๕๕) นางสาวภาณุณี แก่นโพธิ์
- ๑๕๖) นางสาวสุภาวดี แซ่แต้
- ๑๕๗) นางสาวพรวิภา สดาศมน
- ๑๕๘) นายนงนิตย์ วิริยะบาน
- ๑๕๙) นายโคธรมงคล พิทยารณ
- ๑๖๐) นายจริมรณ ประเสริฐสิทธิ์
- ๑๖๑) นายจิรายุส เกษมสุข
- ๑๖๒) นายจิรศักดิ์ ศิริวิชัย
- ๑๖๓) นายณัฐฤทธินันต์ สดหาแก้ว
- ๑๖๔) นายประทีปศักดิ์ ประที
- ๑๖๕) นายนิยมฉวีวงศ์ สมยศทรัพย์
- ๑๖๖) นายพิชญพงษ์ โสโย
- ๑๖๗) นายภัทรพงษ์ นพาททอง
- ๑๖๘) นายสันติ ศรีบุญ
- ๑๖๙) นายภาณุเดช เพชรอุบล
- ๑๗๐) นายอดุลกร วีระแสง
- ๑๗๑) นายภัทรพงษ์ มีสุข
- ๑๗๒) นางสาวนุชวิมล สิงห์ป
- ๑๗๓) นางสาวสุภาวดี โสทัศน์
- ๑๗๔) นางสาวประณิธิ เทียนคำ
- ๑๗๕) นางสาวพนัสนิยา ขอบสอน
- ๑๗๖) นางสาววันวิสาข์ ขอบพิลา
- ๑๗๗) นางสาวจรรวรัตน์ แก้วเพ็ญ
- ๑๗๘) นางสาวอติฉินันท์ เมธวีรัตน์
- ๑๗๙) นางสาววชิรพร คู่ครอง
- ๑๘๐) นายสุเมธี ศิริวรรณ
- ๑๘๑) นางสาวภาววรรณ เก่งจำพัน

พระปิ่นเกล้าฯ 7-๒๐๔-9-๑๐๕๓
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พระปิ่นเกล้าฯ 7-๒๐๔-9-๑๐๕๖
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พระปิ่นเกล้าฯ 7-๒๐๔-9-๑๐๗๔
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สิ่งที่ส่งมาด้วย ๓

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ อก ๐๓๑๐(๓)/ ๑๖๑๖๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๗๔ รายการ

น้ำเสีย จำนวน 60 รายการ

ลำดับที่	สารทดสอบ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method ⁽¹⁾
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method ⁽¹⁾
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method ⁽¹⁾
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽²⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
6	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
7	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
8	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
9	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
10	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽¹⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽¹⁾
12	Carbaryl	High-Performance Liquid Chromatographic Method ⁽¹⁾
13	Carbofuran	High-Performance Liquid Chromatographic Method ⁽¹⁾
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽²⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method ⁽¹⁾ 2) Closed Reflux, Titrimetric Method ⁽¹⁾
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
17	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽²⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
18	Color	ADM1 Weighted-Ordinate Spectrophotometric Method ⁽¹⁾

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

40 Manganese...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽³⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Phosphorous	Digestion, Colorimetric Method ⁽⁴⁾
57	Total Suspended Solids	Dried from 103-105 °C ⁽⁴⁾
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
60	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

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

18 Bis(2-ethylhexyl)phthalate...

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

36 Chrysene...

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

56 1,3-Dichloropropene...

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

76 γ-HCH...

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

94 N-Nitrosodiphenylamine...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾ 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₁₄)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(4,25)

110 TPH (C₁₀-C₁₅)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C ₁₀ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
111	TPH (C ₁₁ -C ₁₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

จากผลเสีย

จากผลเสีย (ปล่อยรวม) จำนวน 28 รายการ

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

15 Lead...

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

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽³⁾
28	Xylene	Adsorption Sampling, Gas Chromatographic Method ⁽³⁾

สิ่งปลูกสร้างหรือวัตถุที่ไม่ใช่พื้นผิว จำนวน 35 รายการ

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

5 Beryllium...

ลำดับที่	สารพิษ	วิธีการหา
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,28) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,26)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,16,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,4,17,19) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,16,19) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method, Calculation Method ^(7,8,17,19)

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1,6,19) 2) Alkaline Digestion, Colorimetric Method ^(8,40)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,11) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,17)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,29)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26)

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,26) 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(9,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

22 Mercury..

ลำดับที่	สารพิษ	วิธีการหา
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(8,6,20) 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1,6,30) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽³⁰⁾ 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²¹⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,28) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,26)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(9,29) 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(9,28) 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,26)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,14) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
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 ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,29) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1,26)

- 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',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 ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26) Electrometric Method ^(25,26) 4) Digestion, Inductively Coupled Plasma Method ^(1,6,16) 5) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 6) Digestion, Inductively Coupled Plasma Method ^(7,16) 7) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
29	pH	
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

31...

สืบ จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,25)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)

11 Benzol(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzol(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
12	Benzol(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,25)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(13,25)
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,26)

23 Cadmium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,19) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,17,19)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,19)

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(27,28,29)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽¹³⁾

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽²¹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾

85 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

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 - 2,3,3',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',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
97	Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
98	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
109	TPH (C ₈ -C ₁₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,3)
110	TPH (C ₁₅ -C ₃₅)	1) Automate Extraction, Gas Chromatographic Method ^(11,22) 2) Solvent Extraction, Gas Chromatographic Method ^(12,22) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(22,3)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,23)

115 2,4,5-Trichlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20)
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,20)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(11,21)
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^(7,16) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)

เอกสารอ้างอิง

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ที่ ๒๓ ๐๓๐๑๒/ ๔๑๒๑

กรมโรงงานอุตสาหกรรม
ถนนพหลโยธินที่ ๒ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ เมษายน ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท แอลแอล แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอขึ้นรายการของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ มีนาคม ๒๕๖๗

ตามที่ข้าพเจ้าอ้างถึง บริษัท แอลแอล แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๙-๐๑๔๓๓-๑๐๔ ขอพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวพรณิศา หุ่นคง ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๒๕

๒) นายกำชัย สุทธะ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๒๓

๓) นางสาวศุภรดา ปิ่นมูรา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๒๘

๒. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

๑) นางสาวฐานิดา กสินเขียว ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๒

๒) นางสาวกัญญ์วิมล สายคำ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๓

๓) นางสาวณัฐนันทน์ กิตติวงค์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๔

๔) นายธนากร วงษาเคน ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๕

๕) นายฤทธิพล ปัญญาวัฒน์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๖

๖) นายณัฐกร หาราชา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๗

๗) นายวิรัตน์ ผ่องใสสวน ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๘

๘) นายณัฐพงศ์ โสภา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๔๙

๙) นายดิเรกพร ปานเพ็ง ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๐

๑๐) นายณัฐพล ชุ่มชื่น ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๑

๑๑) นายธนา สุภาพบุรินทร์ ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๒

๑๒) นายณรรักษ์ นววิทย์ชา ทะเบียนเลขที่ ๖-๒๐๔-๙-๐๑๕๓

อนึ่ง หนังสือฉบับนี้...

(๕๖) นายพชรกร...

(๕๒) นายพรกร เจ็งเจริญ
(๕๓) นายวิภากร เขื่อนมาก
(๕๔) นายอนุวัช ทองขจรศักดิ์
(๕๕) นายอภิชาติ วิลาศ
(๕๖) นายจรัสศรี ศรีรักษา
(๕๗) นายประสานมิตร เขื่อนเพชร
(๕๘) นายภาณุวัฒน์ วิมล
(๖๐) นายสันติ ชัยชนะ
(๖๑) นายทินกร กุลชาติ

ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๔
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๕
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๖
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๗
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๘
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๕๙
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๖๐
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๖๑
ทะเบียนเลขที่ ว-๒๒๓-จ-๐๐๖๒

ค. ขอบข่ายชนิดสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒๘ มิถุนายน ๒๕๖๓ หากประสงค์จะต่ออายุหนังสือ รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายพรกร กิ่งกรทอง)
รองเลขาธิการ
สำนักงานโรงงานอุตสาหกรรม

ศูนย์วิจัยและเคมียกย่องพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๓๓๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒
ไปรษณีย์อิเล็กทรอนิกส์ eww@dw.mae.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทันฯ ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แล็บอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๒๓
ที่ กก ๐๓๒๐/ ๗๕๓๘ ลงวันที่ ๐๔ สิงหาคม ๒๕๖๗

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Macro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[3] 2) Instrumental Analyzer Method ^[2]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[2]
3	Opacity	Ringelmann's Method ^[4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[4] 2) Instrumental Analyzer Method ^[10]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Acid Method ^[9] 2) Instrumental Analyzer Method ^[11]
6	Sulfuric Acid	Isokinetic Sampling, Barium-Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

เอกสารอ้างอิง

๑. ธงชัย พรณวลวิทย์ และวิบูลย์ลักษณ์ วิสสุทธีศักดิ์, บรรณาธิการ, (2547) คู่มือวิเคราะห์ น้ำเสีย, พิมพ์ครั้งที่ 4, กรุงเทพฯ: สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย
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4. กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549, เรื่อง กำหนดค่าปริมาณ หมายความว่าเจือปนในอากาศที่ระบายออกจากรถยนต์ของรถยนต์นั่งส่วนบุคคลไม่เกิน 7 คน, ราชกิจจานุเบกษา, 4 ธันวาคม 2549, เล่มที่ 123 ตอนพิเศษ 1254
5. United States Environmental Protection Agency, Standards of Performance for New Stationary Sources, 40 CFR 60, Appendix A, 2017.
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9. United States Environmental Protection Agency, Determination of Carbon Monoxide Emission from Stationary Sources; Instrumental Analyzer Procedure, 40 CFR 60, Appendix A Method 10, 2017.
10. United States Environmental Protection Agency, Determination of Oxide of Nitrogen Emission from Stationary Sources; Instrumental Analyzer Procedure, 40 CFR 60, Appendix A Method 7E, 2023.
11. United States Environmental Protection Agency, Determination of Sulfur dioxide Emission from Stationary Sources; Instrumental Analyzer Procedure, 40 CFR 60, Appendix A Method 6C, 2017.



๐๙ ตุลาคม ๒๕๖๗

เรื่อง แก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง หนังสือ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขที่ Env.2024/005
ลงวันที่ ๓๐ สิงหาคม ๒๕๖๗

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอลวกแดง
จังหวัดระยอง ขอแก้ไขเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน เนื่องจากมีความคลาดเคลื่อน ความละเอียด
แจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรม ได้รับทราบและดำเนินการแก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการ
วิเคราะห์เอกชน จำนวน ๕ ราย ตามที่แจ้งเรียบร้อยแล้ว เป็นดังนี้

- ลำดับที่ ๒๗ นางพจนา สีดา
- ลำดับที่ ๒๘ นางสาวธนิศา กุลสุริวงศ์
- ลำดับที่ ๓๐ นางชลธิชา สิบงกช
- ลำดับที่ ๓๖ นายสุทธิศักดิ์ โชคปิตินันท์
- ลำดับที่ ๔๒ นายกันตณณ มณีสัมพันธ์

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายพรยศ กลิ่นกรอง)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๓๓๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒
ไปรษณีย์อิเล็กทรอนิกส์ eirw@dlw.mail.go.th

