

ภาคผนวก ค

ใบรับรองผลการวิเคราะห์

คุณภาพอากาศในบรรยากาศ



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590811

Date Received : Nov 10, 2025

Date Reported : Nov 14, 2025

Report Number: 3415540-1

Page 1 of 1

Sample Description	Air Quality				
Location	บ้านนา				
Date Analysis Commenced	Nov 11, 2025				
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag				
Sample Number	Sampled Date	Sampling Condition		Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)
		Pressure (mm Hg)	Temperature (°C)		
2590811-1	Nov 01 - Nov 02, 2025	759	30.1	0.025	0.017
2590811-2	Nov 02 - Nov 03, 2025	759	30.1	0.021	0.015
2590811-3	Nov 03 - Nov 04, 2025	759	30.1	0.020	0.011
2590811-4	Nov 04 - Nov 05, 2025	759	30.1	0.024	0.012
2590811-5	Nov 05 - Nov 06, 2025	759	30.2	0.026	0.020
2590811-6	Nov 06 - Nov 07, 2025	759	30.2	0.060	0.036
2590811-7	Nov 07 - Nov 08, 2025	759	30.2	0.062	0.035
Guideline	-	-	-	0.33	0.12

Reference Method

Total Suspended Particulate : United States Environmental Protection Agency 40 CFR, method 50, Appendix B, revised as of July 1, 2008

Particulate Matter (PM-10) : United States Environmental Protection Agency 40 CFR, method 50, Appendix J, revised as of July 1, 2008

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Jakkarin Manwicha

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590811

Date Received : Nov 10, 2025

Date Reported : Nov 14, 2025

Report Number: 3415540-2

Page 1 of 1

Sample Description	Air Quality				
Location	เมืองระยอง				
Date Analysis Commenced	Nov 11, 2025				
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag				
Sample Number	Sampled Date	Sampling Condition		Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)
		Pressure (mm Hg)	Temperature (°C)		
2590811-8	Nov 01 - Nov 02, 2025	759	30.1	0.023	0.015
2590811-9	Nov 02 - Nov 03, 2025	759	30.1	0.020	0.014
2590811-10	Nov 03 - Nov 04, 2025	759	30.1	0.023	0.015
2590811-11	Nov 04 - Nov 05, 2025	759	30.1	0.027	0.019
2590811-12	Nov 05 - Nov 06, 2025	759	30.2	0.030	0.023
2590811-13	Nov 06 - Nov 07, 2025	759	30.2	0.058	0.033
2590811-14	Nov 07 - Nov 08, 2025	759	30.2	0.059	0.032
Guideline	-	-	-	0.33	0.12

Reference Method

Total Suspended Particulate : United States Environmental Protection Agency 40 CFR, method 50, Appendix B, revised as of July 1, 2008

Particulate Matter (PM-10) : United States Environmental Protection Agency 40 CFR, method 50, Appendix J, revised as of July 1, 2008

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Jakkarin Manwicha

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590811

Date Received : Nov 10, 2025

Date Reported : Nov 14, 2025

Report Number: 3415540-3

Page 1 of 1

Sample Description	Air Quality				
Location	บ้านเนินพยอม				
Date Analysis Commenced	Nov 11, 2025				
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag				
Sample Number	Sampled Date	Sampling Condition		Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)
		Pressure (mm Hg)	Temperature (°C)		
2590811-15	Nov 01 - Nov 02, 2025	759	30.1	0.021	0.014
2590811-16	Nov 02 - Nov 03, 2025	759	30.1	0.022	0.016
2590811-17	Nov 03 - Nov 04, 2025	759	30.1	0.028	0.018
2590811-18	Nov 04 - Nov 05, 2025	759	30.1	0.045	0.027
2590811-19	Nov 05 - Nov 06, 2025	759	30.2	0.037	0.028
2590811-20	Nov 06 - Nov 07, 2025	759	30.2	0.073	0.045
2590811-21	Nov 07 - Nov 08, 2025	759	30.2	0.093	0.057
Guideline		-	-	0.33	0.12

Reference Method

Total Suspended Particulate : United States Environmental Protection Agency 40 CFR, method 50, Appendix B, revised as of July 1, 2008

Particulate Matter (PM-10) : United States Environmental Protection Agency 40 CFR, method 50, Appendix J, revised as of July 1, 2008

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Jakkarin Manwicha

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ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

Lot ID: 2590815

Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

Report Number :3415541-1

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number 2590815-1 to 7
Parameter Wind Speed / Wind Direction
Location บ้านหนอง
Sampling Date Nov 01 - Nov 08, 2025
Sampling by Jakkarin Manwicha

Time	Nov 01 - Nov 02, 2025			Nov 02 - Nov 03, 2025			Nov 03 - Nov 04, 2025			Nov 04 - Nov 05, 2025			Nov 05 - Nov 06, 2025			Nov 06 - Nov 07, 2025			Nov 07 - Nov 08, 2025		
	WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)	
08:00 AM - 09:00 AM	0.3	204.0	SSW	0.4	41.0	NE	2.0	105.0	ESE	1.8	71.0	ENE	0.4	21.0	NNE	2.0	42.0	NE	2.4	313.0	NW
09:00 AM - 10:00 AM	0.3	213.0	SSW	0.3	46.0	NE	0.3	194.0	SSW	0.3	355.0	N	1.0	326.0	NW	2.5	94.0	E	0.3	0.0	N
10:00 AM - 11:00 AM	1.3	185.0	S	1.0	47.0	NE	1.9	158.0	SSE	0.7	345.0	NNW	1.0	8.0	N	1.2	336.0	NNW	2.4	281.0	W
11:00 AM - 12:00 PM	2.4	174.0	S	1.0	32.0	NNE	0.3	191.0	S	0.7	203.0	SSW	0.9	5.0	N	0.3	162.0	SSE	1.7	338.0	NNW
12:00 PM - 01:00 PM	1.8	217.0	SW	0.2	-	-	1.0	214.0	SW	1.0	222.0	SW	1.1	144.0	SE	0.6	190.0	S	0.6	276.0	W
01:00 PM - 02:00 PM	0.3	213.0	SSW	2.1	36.0	NE	1.6	225.0	SW	1.6	176.0	S	0.7	42.0	NE	0.7	145.0	SE	1.1	7.0	N
02:00 PM - 03:00 PM	0.3	177.0	S	0.3	86.0	E	0.4	51.0	NE	1.6	38.0	NE	0.3	41.0	NE	0.3	96.0	E	0.4	330.0	NNW
03:00 PM - 04:00 PM	0.8	252.0	WSW	0.3	58.0	ENE	0.4	273.0	W	0.6	109.0	ESE	0.3	75.0	ENE	0.3	73.0	ENE	0.3	309.0	NW
04:00 PM - 05:00 PM	0.4	254.0	WSW	0.4	133.0	SE	0.7	49.0	NE	0.9	68.0	ENE	0.3	43.0	NE	0.6	61.0	ENE	0.3	281.0	W
05:00 PM - 06:00 PM	0.4	246.0	WSW	0.9	50.0	NE	0.3	45.0	NE	0.3	28.0	NNE	0.3	35.0	NE	0.6	0.0	N	0.3	278.0	W
06:00 PM - 07:00 PM	0.3	4.0	N	1.8	48.0	NE	0.4	306.0	NW	0.8	61.0	ENE	0.5	217.0	SW	0.3	342.0	NNW	0.6	87.0	E
07:00 PM - 08:00 PM	0.4	42.0	NE	1.1	74.0	ENE	0.3	26.0	NNE	0.3	60.0	ENE	0.3	38.0	NE	0.3	297.0	WNW	0.6	59.0	ENE
08:00 PM - 09:00 PM	0.3	313.0	NW	0.4	74.0	ENE	1.5	342.0	NNW	0.5	11.0	N	0.5	34.0	NE	0.5	1.0	N	0.3	59.0	ENE
09:00 PM - 10:00 PM	0.3	339.0	NNW	0.3	50.0	NE	0.7	45.0	NE	0.6	3.0	N	1.4	32.0	NNE	0.7	262.0	W	0.3	288.0	WNW
10:00 PM - 11:00 PM	0.7	333.0	NNW	0.3	43.0	NE	0.3	114.0	ESE	0.8	341.0	NNW	0.3	31.0	NNE	0.5	272.0	W	0.5	359.0	N
11:00 PM - 12:00 AM	0.9	306.0	NW	0.3	5.0	N	1.4	22.0	NNE	2.7	317.0	NW	0.6	0.0	N	0.3	91.0	E	0.5	340.0	NNW
12:00 AM - 01:00 AM	0.5	304.0	NW	0.3	91.0	E	1.0	291.0	WNW	1.1	38.0	NE	0.9	47.0	NE	0.3	259.0	W	0.3	99.0	E
01:00 AM - 02:00 AM	0.3	235.0	SW	1.1	41.0	NE	0.5	309.0	NW	1.5	0.0	N	0.5	326.0	NW	0.3	357.0	N	0.4	104.0	ESE
02:00 AM - 03:00 AM	0.8	235.0	SW	0.7	59.0	ENE	0.9	345.0	NNW	0.7	26.0	NNE	0.3	4.0	N	0.4	273.0	W	1.5	152.0	SSE
03:00 AM - 04:00 AM	1.3	235.0	SW	1.2	56.0	NE	1.1	313.0	NW	1.9	309.0	NW	0.4	349.0	N	0.5	68.0	ENE	0.7	139.0	SE
04:00 AM - 05:00 AM	1.6	234.0	SW	1.1	94.0	E	0.9	15.0	NNE	0.3	0.0	N	0.4	4.0	N	0.4	47.0	NE	0.3	315.0	NW
05:00 AM - 06:00 AM	0.7	233.0	SW	2.4	38.0	NE	1.0	17.0	NNE	0.4	61.0	ENE	1.2	1.0	N	2.3	302.0	WNW	0.3	346.0	NNW
06:00 AM - 07:00 AM	0.3	233.0	SW	0.7	1.0	N	1.2	99.0	E	0.9	94.0	E	1.9	348.0	NNW	0.3	354.0	N	0.5	355.0	N
07:00 AM - 08:00 AM	0.9	224.0	SW	1.1	113.0	ESE	1.6	103.0	ESE	1.2	113.0	ESE	1.0	349.0	N	0.4	348.0	NNW	1.6	301.0	WNW

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

The above results are valid only for the analyzed/tested sample(s) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

Approved by

Sarayuth Jittrantont
Assistant General Manager



Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590815

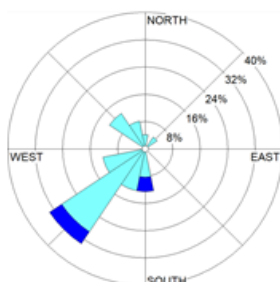
Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

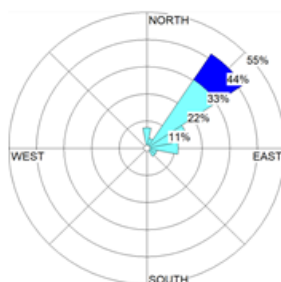
Report Number :3415541-1

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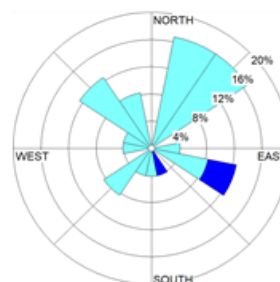
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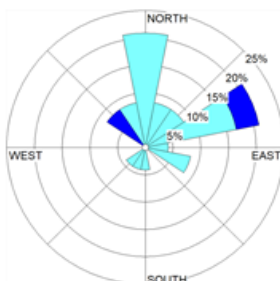
Date : Nov 01-02, 2025



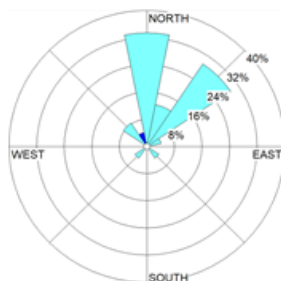
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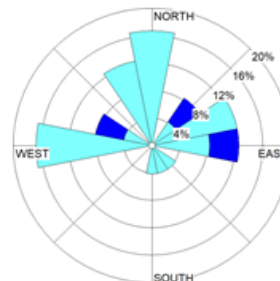
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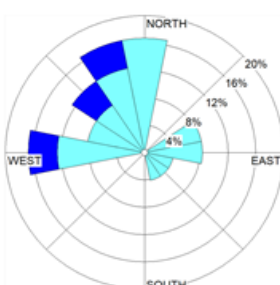
Date : Nov 04-05, 2025



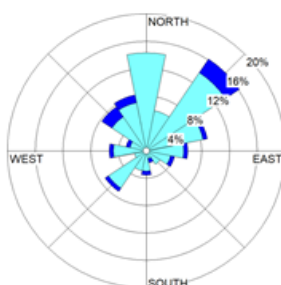
Date : Nov 05-06, 2025



Date : Nov 06-07, 2025



Date : Nov 07-08, 2025



Date : Nov 01-08, 2025

WS (m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	10.12
0.3-1.7	89.29
Calms	0.60

Location : บ้านนา

The above results are valid only for the analyzed/tested sample(s) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

Approved by

Sarayuth Jitranont
Assistant General Manager



Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

Lot ID: 2590815

Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

Report Number :3415541-1

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number 2590815-8 to 14
Parameter Wind Speed / Wind Direction
Location บ้านนาบะ
Sampling Date Nov 01 - Nov 08, 2025
Sampling by Jakkarin Manwicha

Time	Nov 01 - Nov 02, 2025			Nov 02 - Nov 03, 2025			Nov 03 - Nov 04, 2025			Nov 04 - Nov 05, 2025			Nov 05 - Nov 06, 2025			Nov 06 - Nov 07, 2025			Nov 07 - Nov 08, 2025		
	WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)	
09:00 AM - 10:00 AM	0.2	-	-	0.2	-	-	1.8	177.0	S	0.0	-	-	1.4	328.0	NNW	1.2	355.0	N	3.8	343.0	NNW
10:00 AM - 11:00 AM	0.1	-	-	0.6	352.0	N	3.9	235.0	SW	1.8	359.0	N	1.6	58.0	ENE	1.4	312.0	NW	1.4	0.0	N
11:00 AM - 12:00 PM	0.8	109.0	ESE	0.8	311.0	NW	0.0	-	-	2.0	190.0	S	0.0	-	-	0.0	-	-	3.5	301.0	WNW
12:00 PM - 01:00 PM	1.1	132.0	SE	0.0	-	-	1.5	252.0	WSW	0.7	217.0	SW	0.8	3.0	N	1.1	268.0	W	3.3	332.0	NNW
01:00 PM - 02:00 PM	0.7	148.0	SSE	0.5	78.0	ENE	0.6	283.0	WNW	0.5	302.0	WNW	1.2	36.0	NE	0.0	-	-	2.3	269.0	W
02:00 PM - 03:00 PM	0.0	-	-	0.6	129.0	SE	0.2	-	-	1.4	36.0	NE	1.2	29.0	NNE	1.0	33.0	NNE	0.3	298.0	WNW
03:00 PM - 04:00 PM	0.2	-	-	0.0	-	-	2.0	12.0	NNE	0.0	-	-	1.5	36.0	NE	0.0	-	-	0.7	310.0	NW
04:00 PM - 05:00 PM	0.3	117.0	ESE	0.2	-	-	0.3	315.0	NW	0.0	-	-	1.2	24.0	NNE	0.0	-	-	0.0	-	-
05:00 PM - 06:00 PM	0.1	-	-	0.4	38.0	NE	0.6	46.0	NE	0.0	-	-	1.3	14.0	NNE	0.0	-	-	0.0	-	-
06:00 PM - 07:00 PM	0.8	252.0	WSW	0.9	18.0	NNE	0.4	40.0	NE	0.1	-	-	1.2	41.0	NE	0.0	-	-	0.0	-	-
07:00 PM - 08:00 PM	0.0	-	-	0.5	14.0	NNE	0.7	24.0	NNE	1.9	18.0	NNE	1.1	34.0	NE	0.0	-	-	0.0	-	-
08:00 PM - 09:00 PM	0.5	24.0	NNE	0.5	36.0	NE	1.2	20.0	NNE	1.3	13.0	NNE	1.0	33.0	NNE	0.3	359.0	N	0.0	-	-
09:00 PM - 10:00 PM	0.6	146.0	SE	0.0	-	-	0.7	358.0	N	1.5	60.0	ENE	1.1	22.0	NNE	0.5	358.0	N	0.8	358.0	N
10:00 PM - 11:00 PM	0.4	55.0	NE	0.0	-	-	0.0	-	-	1.6	10.0	N	0.7	9.0	N	0.0	-	-	0.7	0.0	N
11:00 PM - 12:00 AM	0.0	-	-	2.1	45.0	NE	0.4	0.0	N	0.9	28.0	NNE	0.6	11.0	N	0.0	-	-	0.4	0.0	N
12:00 AM - 01:00 AM	0.0	-	-	1.9	344.0	NNW	0.0	-	-	2.3	12.0	NNE	1.3	45.0	NE	0.0	-	-	0.0	-	-
01:00 AM - 02:00 AM	0.5	76.0	ENE	0.1	-	-	0.7	1.0	N	1.0	28.0	NNE	1.1	24.0	NNE	0.4	19.0	NNE	0.0	-	-
02:00 AM - 03:00 AM	0.6	32.0	NNE	0.7	8.0	N	0.8	31.0	NNE	0.2	-	-	0.9	18.0	NNE	1.1	37.0	NE	0.0	-	-
03:00 AM - 04:00 AM	0.8	114.0	ESE	0.0	-	-	0.0	-	-	1.0	352.0	N	2.0	54.0	NE	1.1	9.0	N	0.0	-	-
04:00 AM - 05:00 AM	0.2	-	-	0.7	41.0	NE	1.0	45.0	NE	1.9	15.0	NNE	1.9	8.0	N	1.1	28.0	NNE	0.0	-	-
05:00 AM - 06:00 AM	0.2	-	-	1.3	42.0	NE	0.1	-	-	2.0	37.0	NE	2.8	34.0	NE	0.9	0.0	N	0.0	-	-
06:00 AM - 07:00 AM	0.3	18.0	NNE	1.4	0.0	N	1.3	36.0	NE	1.3	66.0	ENE	3.5	49.0	NE	0.8	306.0	NW	0.3	300.0	WNW
07:00 AM - 08:00 AM	0.0	-	-	1.6	0.0	N	1.4	31.0	NNE	1.1	66.0	ENE	0.5	11.0	N	3.7	332.0	NNW	0.7	31.0	NNE
08:00 AM - 09:00 AM	1.3	141.0	SE	0.0	-	-	0.0	-	-	2.6	4.0	N	1.3	58.0	ENE	2.0	359.0	N	0.1	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittrantont
Assistant General Manager



Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590815

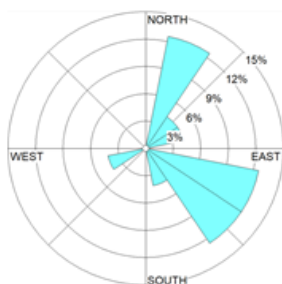
Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

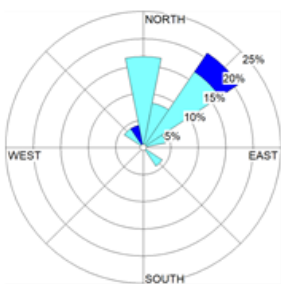
Report Number :3415541-1

Page 2 of 2

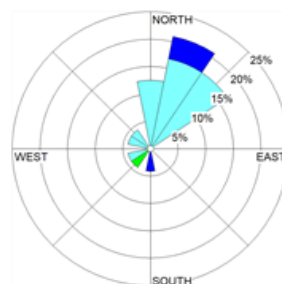
Wind Rose



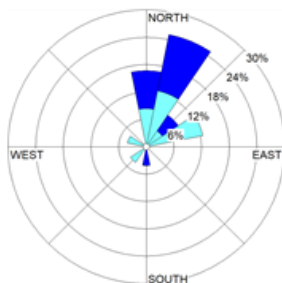
Date : Nov 01-02, 2025



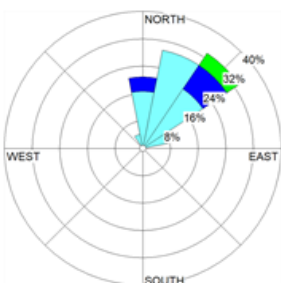
Date : Nov 02-03, 2025



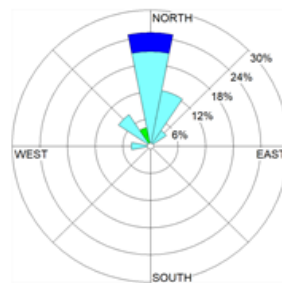
Date : Nov 03-04, 2025



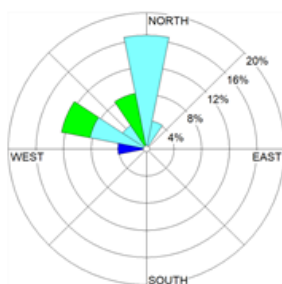
Date : Nov 04-05, 2025



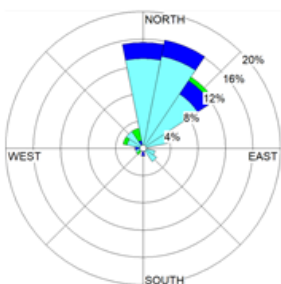
Date : Nov 05-06, 2025



Date : Nov 06-07, 2025



Date : Nov 07-08, 2025



Date : Nov 01-08, 2025

WS (m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	3.57
1.7-3.3	9.52
0.3-1.7	53.57
Calms	33.33

Location : บ้านนาบ

The above results are valid only for the analyzed/tested sample(s) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

Approved by

Sarayuth Jitranont
Assistant General Manager



Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

Lot ID: 2590815

Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

Report Number :3415541-1

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number 2590815-15 to 21
Parameter Wind Speed / Wind Direction
Location บ้านเนินพยอม
Sampling Date Nov 01 - Nov 08, 2025
Sampling by Jakkarin Manwicha

Time	Nov 01 - Nov 02, 2025			Nov 02 - Nov 03, 2025			Nov 03 - Nov 04, 2025			Nov 04 - Nov 05, 2025			Nov 05 - Nov 06, 2025			Nov 06 - Nov 07, 2025			Nov 07 - Nov 08, 2025		
	WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)	
10:00 AM - 11:00 AM	0.5	254.0	WSW	0.1	-	-	0.0	-	-	1.6	48.0	NE	0.0	-	-	0.0	-	-	0.1	-	-
11:00 AM - 12:00 PM	0.0	-	-	0.3	166.0	SSE	0.8	53.0	NE	2.4	23.0	NNE	1.9	33.0	NNE	2.1	0.0	N	0.1	-	-
12:00 PM - 01:00 PM	0.0	-	-	0.0	-	-	1.3	183.0	S	0.3	39.0	NE	1.5	359.0	N	0.0	-	-	0.7	83.0	E
01:00 PM - 02:00 PM	0.2	-	-	0.3	196.0	SSW	1.2	195.0	SSW	0.6	57.0	ENE	0.4	5.0	N	0.2	-	-	0.1	-	-
02:00 PM - 03:00 PM	0.2	-	-	0.3	38.0	NE	1.4	225.0	SW	0.0	-	-	0.7	21.0	NNE	0.0	-	-	0.5	43.0	NE
03:00 PM - 04:00 PM	0.0	-	-	0.0	-	-	1.0	229.0	SW	1.2	208.0	SSW	1.7	4.0	N	0.0	-	-	0.2	-	-
04:00 PM - 05:00 PM	0.0	-	-	0.1	-	-	0.0	-	-	0.0	-	-	1.3	28.0	NNE	0.1	-	-	0.0	-	-
05:00 PM - 06:00 PM	0.6	344.0	NNW	0.0	-	-	0.0	-	-	0.2	-	-	1.5	23.0	NNE	0.0	-	-	0.0	-	-
06:00 PM - 07:00 PM	0.1	-	-	0.0	-	-	0.0	-	-	0.2	-	-	0.7	5.0	N	0.0	-	-	0.0	-	-
07:00 PM - 08:00 PM	0.5	23.0	NNE	0.0	-	-	0.4	27.0	NNE	0.0	-	-	0.4	13.0	NNE	0.0	-	-	0.0	-	-
08:00 PM - 09:00 PM	1.0	12.0	NNE	0.0	-	-	2.4	2.0	N	0.5	30.0	NNE	0.0	-	-	0.3	74.0	ENE	0.0	-	-
09:00 PM - 10:00 PM	0.3	12.0	NNE	0.3	37.0	NE	1.3	34.0	NE	1.5	21.0	NNE	0.0	-	-	0.0	-	-	0.0	-	-
10:00 PM - 11:00 PM	0.6	12.0	NNE	0.0	-	-	0.3	47.0	NE	0.7	37.0	NE	0.0	-	-	0.5	74.0	ENE	0.2	-	-
11:00 PM - 12:00 AM	0.6	15.0	NNE	0.6	38.0	NE	0.0	-	-	1.3	33.0	NNE	0.3	17.0	NNE	0.2	-	-	0.0	-	-
12:00 AM - 01:00 AM	0.6	32.0	NNE	0.0	-	-	0.6	36.0	NE	1.3	46.0	NE	0.0	-	-	0.2	-	-	0.0	-	-
01:00 AM - 02:00 AM	0.0	-	-	0.8	26.0	NNE	0.8	18.0	NNE	1.8	23.0	NNE	0.6	36.0	NE	0.0	-	-	0.0	-	-
02:00 AM - 03:00 AM	0.0	-	-	0.6	24.0	NNE	0.0	-	-	0.6	39.0	NE	1.2	28.0	NNE	0.6	74.0	ENE	1.1	53.0	NE
03:00 AM - 04:00 AM	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	-	1.2	37.0	NE	0.3	74.0	ENE	0.4	126.0	SE
04:00 AM - 05:00 AM	0.1	-	-	0.0	-	-	0.5	9.0	N	0.0	-	-	0.0	-	-	0.8	32.0	NNE	0.4	145.0	SE
05:00 AM - 06:00 AM	0.5	22.0	NNE	0.1	-	-	0.7	41.0	NE	1.1	41.0	NE	0.8	23.0	NNE	0.7	33.0	NNE	0.0	-	-
06:00 AM - 07:00 AM	0.0	-	-	0.1	-	-	1.3	49.0	NE	1.5	9.0	N	1.8	14.0	NNE	0.6	44.0	NE	0.2	-	-
07:00 AM - 08:00 AM	0.0	-	-	0.0	-	-	0.6	28.0	NNE	1.3	0.0	N	2.6	14.0	NNE	0.0	-	-	0.3	188.0	S
08:00 AM - 09:00 AM	0.5	13.0	NNE	1.8	3.0	N	2.4	16.0	NNE	0.6	38.0	NE	1.3	38.0	NE	1.4	36.0	NE	0.2	-	-
09:00 AM - 10:00 AM	0.0	-	-	1.2	30.0	NNE	1.5	5.0	N	0.9	7.0	N	1.2	359.0	N	1.6	31.0	NNE	0.7	166.0	SSE

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittrantont
Assistant General Manager



Analysis / Test Report

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590815

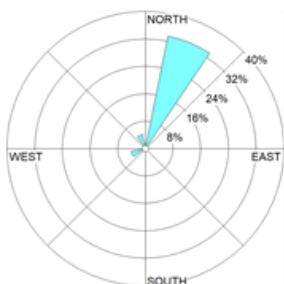
Date Received :Nov 10, 2025

Date Reported :Nov 17, 2025

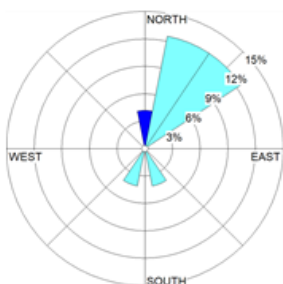
Report Number :3415541-1

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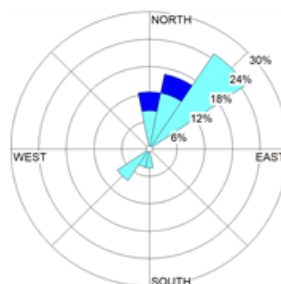
Wind Rose



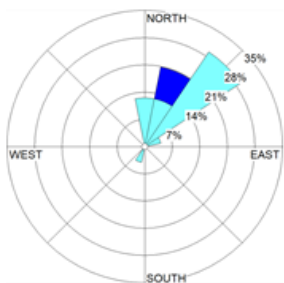
Date : Nov 01-02, 2025



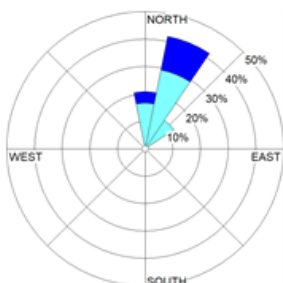
Date : Nov 02-03, 2025



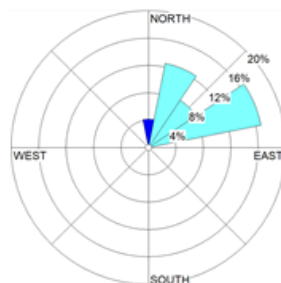
Date : Nov 03-04, 2025



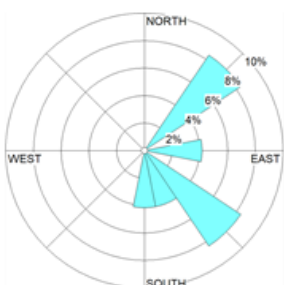
Date : Nov 04-05, 2025



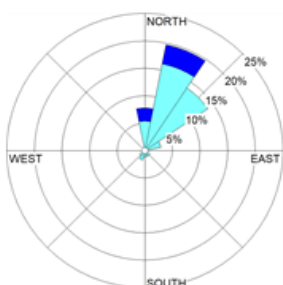
Date : Nov 05-06, 2025



Date : Nov 06-07, 2025



Date : Nov 07-08, 2025



Date : Nov 01-08, 2025

WS (m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	5.95
0.3-1.7	46.43
Calms	47.62

Location : บ้านเนินพยอม

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Approved by

Sarayuth Jitranont
Assistant General Manager

คุณภาพอากาศจากปล่องระบายอากาศ



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590821

Date Received : Nov 03, 2025
Date Reported : Nov 07, 2025
Report Number: 3415548-1

Page 1 of 2

Sample Number 2590821-1
Sampled Date Nov 03, 2025
Sample Description Emission from Stationary Source
Location Turbulence dust collector
Date Analysis Commenced Nov 04, 2025
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	755	mmHg	Diameter	0.80	m	Oxygen	21.0	%
Ambient Temperature	28.0	°C	Shape	Circle		Carbon Dioxide	0.0	%
Type of Process	Process		Stack Temperature	40.8	°C	Gas Velocity	9.8	m/s
Type of Fuel	-		Moisture	2.25	%	Flow Rate (Actual O2)	16384	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate	10:10 AM - 10:52 AM	mg/m3	-	0.5	<0.5	400	60	U.S. Environmental Protection Agency 40 CFR method 5, Appendix A, December 7, 2020 (Include sampling)	Rayong

Guideline : Guideline(1) : Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
Guideline(2) : Environmental Impact Assessment Report of THAI MMA Co., Ltd.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0029

Approved by

D. Changchon.

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Life Sciences

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RIGHT SOLUTIONS RIGHT PARTNER



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590821

Date Received : Nov 03, 2025
Date Reported : Nov 07, 2025
Report Number: 3415548-1

Page 2 of 2

Sample Number 2590821-1
Sampled Date Nov 03, 2025
Sample Description Emission from Stationary Source
Location Turbulence dust collector
Date Analysis Commenced Nov 04, 2025
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	755	mmHg	Diameter	0.80	m	Oxygen	21.0	%
Ambient Temperature	28.0	°C	Shape	Circle		Carbon Dioxide	0.0	%
Type of Process	Process		Stack Temperature	40.8	°C	Gas Velocity	9.8	m/s
Type of Fuel	-		Moisture	2.25	%	Flow Rate (Actual O2)	16384	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	10:10 AM - 10:52 AM	g/s	-	-	<0.002	-	0.22	Calculated	Rayong

Guideline : Guideline(1) : Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
Guideline(2) : Environmental Impact Assessment Report of THAI MMA Co., Ltd.

Sampling By : Tinnakorn Kulchart ทะเบียนเลขที่ ว-323-จ-0062

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0029

Approved by

D. Changchon.

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590824

Date Received : Nov 03, 2025
Date Reported : Nov 20, 2025
Report Number: 3415549-1

Page 1 of 2

Sample Number 2590824-1
Sampled Date Nov 03, 2025
Sample Description Emission from Stationary Source
Location Main Stack
Date Analysis Commenced Nov 04, 2025
Condition of Sample Extracted into two sorbent tubes, refrigerated

Stack Description

Ambient Pressure	755	mmHg	Diameter	1.60 x 1.60	m	Oxygen	21.0	%
Ambient Temperature	28.0	°C	Shape	Square		Carbon Dioxide	0.0	%
Type of Process	Process		Stack Temperature	22.4	°C	Gas Velocity	3.2	m/s
Type of Fuel	-		Moisture	2.71	%	Flow Rate (Actual O2)	28413	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Testing Location
Air Testing								
Butyl acrylate	10:50 AM - 11:05 AM	ppm	-	0.3	<0.3	No Standard	U.S. Environmental Protection Agency, EPA Method 18	Bangkok
Butyl acrylate	10:50 AM - 11:05 AM	mg/m3	-	1.0	<1.0	39	U.S. Environmental Protection Agency, EPA Method 18	Bangkok
Methyl Methacrylate	10:50 AM - 11:05 AM	ppm	-	0.3	13.4	No Standard	U.S. Environmental Protection Agency, EPA Method 18	Bangkok
Methyl Methacrylate	10:50 AM - 11:05 AM	mg/m3	-	1.0	55.0	520	U.S. Environmental Protection Agency, EPA Method 18	Bangkok

Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590824

Date Received : Nov 03, 2025
Date Reported : Nov 20, 2025
Report Number: 3415549-1

Page 2 of 2

Sample Number 2590824-1
Sampled Date Nov 03, 2025
Sample Description Emission from Stationary Source
Location Main Stack
Date Analysis Commenced Nov 04, 2025
Condition of Sample Extracted into two sorbent tubes, refrigerated

Stack Description

Ambient Pressure	755	mmHg	Diameter	1.60 x 1.60	m	Oxygen	21.0	%
Ambient Temperature	28.0	°C	Shape	Square		Carbon Dioxide	0.0	%
Type of Process	Process		Stack Temperature	22.4	°C	Gas Velocity	3.2	m/s
Type of Fuel	-		Moisture	2.71	%	Flow Rate (Actual O2)	28413	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline Limit	Method	Testing Location
Air Testing								
Butyl acrylate	10:50 AM - 11:05 AM	g/s	-	-	<0.01	0.13	Calculated	Bangkok
Methyl Methacrylate	10:50 AM - 11:05 AM	g/s	-	-	0.43	1.73	Calculated	Bangkok

Guideline : Environmental Impact Assessment Report of THAI MMA Co., Ltd.

Sampling By : Apisit Singha

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590826
Date Received : Nov 03, 2025
Date Reported : Nov 11, 2025
Report Number: 3415550-1

Page 1 of 1

Sample Number 2590826-1
Sampled Date Nov 03, 2025
Sample Description Emission from Stationary Source
Location ปล่อง Carbon Absorber
Date Analysis Commenced Nov 06, 2025
Condition of Sample Extracted into one 10-L air sampling bag

Stack Description

Ambient Pressure	755	mmHg	Diameter	0.15	m	Oxygen	20.9	%
Ambient Temperature	28.0	°C	Shape	Circle		Carbon Dioxide	0.0	%
Type of Process	Process		Stack Temperature	31.0	°C	Gas Velocity	8.7	m/s
Type of Fuel	-		Moisture	2.71	%	Flow Rate (Actual O2)	524	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result	Method	Testing Location
Air Testing							
Total VOCs as Propane	11:30 AM - 11:40 AM	ppm	-	1.0	3.5	U.S. Environmental Protection Agency, EPA Method 25A	Bangkok

Sampling By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

คุณภาพน้ำ



Analysis / Test Report

TESTING

No.0042

Lot ID: 2553287

Date Received : Jul 04, 2025

Date Reported : Jul 11, 2025

Report Number : 3322213-1

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number	2553287-1						
Sampled Date	Jul 04, 2025 2:00 PM						
Sample Description	Wastewater						
Location	บ่อบำบัดน้ำเสีย Cesspool						
Date Analysis Commenced	Jul 04, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	22.0	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	55	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.0	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	35.2	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	368	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	9	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ว-323-จ-0038

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Photchana S

Photchana Seeda

Scientist (4)

ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 2553287
Date Received : Jul 04, 2025
Date Reported : Jul 11, 2025
Report Number : 3322213-1

Page 2 of 2

Technical Management

PhotchanaS

Photchana Seeda
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Johnson

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2553287

Date Received : Jul 04, 2025
Date Reported : Jul 11, 2025
Report Number : 3322213-2

Page 1 of 1

Sample Number	2553287-1						
Sampled Date	Jul 04, 2025 2:00 PM						
Sample Description	Wastewater						
Location	บ่อเสาะน้ำ Cesspool						
Date Analysis Commenced	Jul 05, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Sulfate	mg/L	0.6	2	61.3	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow

Remark :

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Approved by

PhotchanaS

Photchana Seeda
Scientist (4)

ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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Analysis / Test Report

TESTING

No.0042

Lot ID: 2563654

Date Received : Aug 08, 2025

Date Reported : Aug 16, 2025

Report Number : 3350312-1

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number	2563654-1						
Sampled Date	Aug 08, 2025 2:00 PM						
Sample Description	Wastewater						
Location	บ่อสุดท้าย Cesspool						
Date Analysis Commenced	Aug 08, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	35.5	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	76	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.2	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	33.9	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	344	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ๖-323-จ-0038

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Jitsupa P.

Jitsupa Pratuangsuk
Scientist (2)

ทะเบียนเลขที่ ๖-323-จ-0004

Approved by

D. Changchon.

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ๖-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 2563654
Date Received : Aug 08, 2025
Date Reported : Aug 16, 2025
Report Number : 3350312-1

Page 2 of 2

Technical Management

Jitsupa P.

Jitsupa Pratuangsuk
Scientist (2)
ทะเบียนเลขที่ ว-323-จ-0004

Approved by

D. Changchon.

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563654

Date Received : Aug 08, 2025

Date Reported : Aug 16, 2025

Report Number : 3350312-2

Page 1 of 1

Sample Number	2563654-1						
Sampled Date	Aug 08, 2025 2:00 PM						
Sample Description	Wastewater						
Location	บ่อเสาะน้ำ Cesspool						
Date Analysis Commenced	Aug 09, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Sulfate	mg/L	0.6	2	59.2	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Jitsupa P.

Jitsupa Pratuangsuk
Scientist (2)

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Analysis / Test Report

TESTING

No.0042

Lot ID: 2575728

Date Received : Sep 05, 2025

Date Reported : Sep 12, 2025

Report Number : 3380986-1

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number	2575728-1						
Sampled Date	Sep 05, 2025 2:15 PM						
Sample Description	Wastewater						
Location	บ่อสุดท้าย Cesspool						
Date Analysis Commenced	Sep 05, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	<2.0	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	32	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.4	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Sulfate *	mg/L	0.6	2	70.8	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong
Temperature *	Degree C	-	-	31.4	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	358	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	12	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ๖-323-จ-0038

Remark :

Technical Management

Jitsupa P.

Jitsupa Pratuangsuk
Scientist (2)

ทะเบียนเลขที่ ๖-323-จ-0004

Approved by

D. Changchon.

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ๖-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 2575728
Date Received : Sep 05, 2025
Date Reported : Sep 12, 2025
Report Number : 3380986-1

Page 2 of 2

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- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Jitsupa P.

Jitsupa Pratuangsuk
Scientist (2)
ทะเบียนเลขที่ ว-323-จ-0004

Approved by

D. Changchon.

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

TESTING

No.0042

Lot ID: 2583229

Date Received : Oct 10, 2025

Date Reported : Oct 18, 2025

Report Number : 3397034-1

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number	2583229-1						
Sampled Date	Oct 10, 2025 1:50 PM						
Sample Description	Wastewater						
Location	บ่อบำบัดน้ำเสีย Cesspool						
Date Analysis Commenced	Oct 10, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	14.9	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	55	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.5	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	33.1	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	254	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	7	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ว-323-จ-0038

Remark :

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- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Photchana S

Photchana Seeda

Scientist (4)

ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 2583229
Date Received : Oct 10, 2025
Date Reported : Oct 18, 2025
Report Number : 3397034-1

Page 2 of 2

Technical Management

PhotchanaS

Photchana Seeda
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Chumson.

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2583229

Date Received : Oct 10, 2025

Date Reported : Oct 18, 2025

Report Number : 3397034-2

Page 1 of 1

Sample Number	2583229-1
Sampled Date	Oct 10, 2025 1:50 PM
Sample Description	Wastewater
Location	บ่อเสาะน้ำ Cesspool
Date Analysis Commenced	Oct 10, 2025
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Sulfate	mg/L	0.6	2	49.6	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow

Remark :

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Approved by

PhotchanaS

Photchana Seeda
Scientist (4)

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Analysis / Test Report

TESTING

No.0042

Lot ID: 2590837

Date Received : Nov 06, 2025

Date Reported : Nov 13, 2025

Report Number : 3415585-1

Client : THAI MMA Co., Ltd.

88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Page 1 of 2

Sample Number	2590837-1						
Sampled Date	Nov 06, 2025 2:05 PM						
Sample Description	Wastewater						
Location	บ่อสุดท้าย Cesspool						
Date Analysis Commenced	Nov 06, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	10.3	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	39	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.1	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	33.7	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	340	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ว-323-จ-0038

Remark :

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- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Photchana S

Photchana Seeda

Scientist (4)

ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 2590837
Date Received : Nov 06, 2025
Date Reported : Nov 13, 2025
Report Number : 3415585-1

Page 2 of 2

Technical Management

PhotchanaS

Photchana Seeda
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Johnson

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590837

Date Received : Nov 06, 2025

Date Reported : Nov 13, 2025

Report Number : 3415585-2

Page 1 of 1

Sample Number	2590837-1						
Sampled Date	Nov 06, 2025 2:05 PM						
Sample Description	Wastewater						
Location	บ่อเสาะน้ำ Cesspool						
Date Analysis Commenced	Nov 06, 2025						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Sulfate	mg/L	0.6	2	62.7	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

PhotchanaS

Photchana Seeda
Scientist (4)

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 25102056
Date Received : Dec 04, 2025
Date Reported : Dec 13, 2025
Report Number : 3443301-1

Page 1 of 2

Sample Number 25102056-1
Sampled Date Dec 04, 2025 1:55 PM
Sample Description Wastewater
Location บ่อสุดท้าย Cesspool
Date Analysis Commenced Dec 04, 2025
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards. (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	10.8	≤500	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	55	≤750	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 5520 B	Rayong
pH at 25 degree C		-	-	7.2	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	34.8	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	376	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	9	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow ทะเบียนเลขที่ ว-323-จ-0038

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- Sampling is not included in scope of accreditation ISO/IEC 17025

Technical Management

Photchana S

Photchana Seeda
Scientist (4)

ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Changchon

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ว-323-ค-0001

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

TESTING
No.0042
Lot ID: 25102056
Date Received : Dec 04, 2025
Date Reported : Dec 13, 2025
Report Number : 3443301-1

Page 2 of 2

Technical Management

PhotchanaS

Photchana Seeda
Scientist (4)
ทะเบียนเลขที่ ว-323-จ-0028

Approved by

D. Johnson

Dej Changchon
Senior Manager
ทะเบียนเลขที่ ว-323-ค-0001

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 25102056

Date Received : Dec 04, 2025

Date Reported : Dec 13, 2025

Report Number : 3443301-2

Page 1 of 1

Sample Number	25102056-1
Sampled Date	Dec 04, 2025 1:55 PM
Sample Description	Wastewater
Location	บ่อเสาะน้ำ Cesspool
Date Analysis Commenced	Dec 06, 2025
Condition of Sample	Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards. (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Sulfate	mg/L	0.6	2	37.8	No Standard	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 24th ed., 2023, part 4500-SO4 (E)	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.029/2567 : General Standards for Wastewater drainage into central wastewater treatment systems in Industrial Estates.

Sampling By : Wanlop Hunchainaow

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

PhotchanaS

Photchana Seeda
Scientist (4)

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ระดับเสียง



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590820

Date Received : Nov 10, 2025
Date Reported : Nov 14, 2025
Report Number: 3450572-1

Page 1 of 1

Sample Number 2590820-1
Parameter Noise (Leq 24 hrs.)
Location บ้านบน
Measurement Date Nov 01 - Nov 02, 2025
Measurement by Jakkarin Manwicha
Sound Level meter Serial No. 1222723

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	60.2	83.4	56.6
10:00 AM - 11:00 AM	58.7	78.3	56.0
11:00 AM - 12:00 PM	59.9	80.7	55.5
12:00 PM - 01:00 PM	59.4	77.9	55.3
01:00 PM - 02:00 PM	60.0	84.3	55.1
02:00 PM - 03:00 PM	62.3	78.0	55.4
03:00 PM - 04:00 PM	60.3	78.6	56.2
04:00 PM - 05:00 PM	59.0	76.5	55.7
05:00 PM - 06:00 PM	59.4	79.9	55.9
06:00 PM - 07:00 PM	57.0	73.9	52.8
07:00 PM - 08:00 PM	55.8	76.4	49.3
08:00 PM - 09:00 PM	55.1	72.3	48.5
09:00 PM - 10:00 PM	55.0	72.8	48.1
10:00 PM - 11:00 PM	55.1	79.2	47.4
11:00 PM - 12:00 AM	57.2	72.2	47.9
12:00 AM - 01:00 AM	60.6	79.6	48.8
01:00 AM - 02:00 AM	59.1	72.5	48.7
02:00 AM - 03:00 AM	57.5	78.7	48.8
03:00 AM - 04:00 AM	54.0	72.8	48.9
04:00 AM - 05:00 AM	55.8	75.4	50.6
05:00 AM - 06:00 AM	59.7	78.5	52.6
06:00 AM - 07:00 AM	57.9	74.1	53.7
07:00 AM - 08:00 AM	57.9	75.2	54.9
08:00 AM - 09:00 AM	58.0	71.1	55.2

Leq Average 24 hrs. (dB(A)) 58.6
Lmax (dB(A)) 84.3
L90 (dB(A)) 52.8
Ldn (dB(A)) 64.5

Standard (dB(A)) 70 115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590820
Date Received : Nov 10, 2025
Date Reported : Nov 14, 2025
Report Number: 3450573-1

Page 1 of 1

Sample Number 2590820-2
Parameter Noise (Leq 24 hrs.)
Location บ้านบน
Measurement Date Nov 02 - Nov 03, 2025
Measurement by Jakkarin Manwicha
Sound Level meter Serial No. 1222723

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	58.2	77.0	56.6
10:00 AM - 11:00 AM	60.6	80.2	58.1
11:00 AM - 12:00 PM	63.2	82.0	58.4
12:00 PM - 01:00 PM	59.2	76.6	57.5
01:00 PM - 02:00 PM	62.2	84.6	57.7
02:00 PM - 03:00 PM	60.1	79.5	57.7
03:00 PM - 04:00 PM	60.8	80.4	58.3
04:00 PM - 05:00 PM	60.3	77.3	58.1
05:00 PM - 06:00 PM	61.4	78.7	58.8
06:00 PM - 07:00 PM	60.8	75.9	55.4
07:00 PM - 08:00 PM	62.1	76.2	53.8
08:00 PM - 09:00 PM	64.3	73.3	56.5
09:00 PM - 10:00 PM	65.3	76.3	54.4
10:00 PM - 11:00 PM	65.7	82.4	60.4
11:00 PM - 12:00 AM	65.4	71.0	61.2
12:00 AM - 01:00 AM	62.5	73.1	51.2
01:00 AM - 02:00 AM	60.3	69.7	51.6
02:00 AM - 03:00 AM	59.4	78.3	54.5
03:00 AM - 04:00 AM	56.8	75.5	52.8
04:00 AM - 05:00 AM	58.4	75.5	53.4
05:00 AM - 06:00 AM	63.5	95.3	57.6
06:00 AM - 07:00 AM	62.1	85.6	58.3
07:00 AM - 08:00 AM	60.6	81.0	57.4
08:00 AM - 09:00 AM	59.8	82.7	56.3

Leq Average 24 hrs. (dB(A)) 62.0
Lmax (dB(A)) 95.3
L90 (dB(A)) 57.4
Ldn (dB(A)) 68.8

Standard (dB(A)) 70

115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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Analysis / Test Report



TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590820

Date Received : Nov 10, 2025

Date Reported : Nov 14, 2025

Report Number: 3450574-1

Page 1 of 1

Sample Number : 2590820-3
Parameter : Noise (Leq 24 hrs.)
Location : บ้านบน
Measurement Date : Nov 03 - Nov 04, 2025
Measurement by : Jakkarin Manwicha
Sound Level meter : Serial No. 1222723

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:00 AM - 10:00 AM	59.0	77.9	56.1
10:00 AM - 11:00 AM	58.4	72.8	55.2
11:00 AM - 12:00 PM	59.1	77.9	54.5
12:00 PM - 01:00 PM	61.2	85.6	56.4
01:00 PM - 02:00 PM	58.8	83.4	56.0
02:00 PM - 03:00 PM	59.2	77.0	55.7
03:00 PM - 04:00 PM	58.5	87.5	55.3
04:00 PM - 05:00 PM	62.5	76.4	57.3
05:00 PM - 06:00 PM	60.7	72.2	57.2
06:00 PM - 07:00 PM	59.8	76.6	55.9
07:00 PM - 08:00 PM	58.6	79.3	54.2
08:00 PM - 09:00 PM	60.9	83.4	54.5
09:00 PM - 10:00 PM	57.4	80.5	52.4
10:00 PM - 11:00 PM	55.7	71.7	52.1
11:00 PM - 12:00 AM	56.5	73.1	50.9
12:00 AM - 01:00 AM	60.4	69.1	50.8
01:00 AM - 02:00 AM	58.7	69.7	50.8
02:00 AM - 03:00 AM	55.4	71.0	50.5
03:00 AM - 04:00 AM	53.8	65.4	50.8
04:00 AM - 05:00 AM	59.1	74.5	54.0
05:00 AM - 06:00 AM	62.1	80.0	57.3
06:00 AM - 07:00 AM	63.6	90.4	56.9
07:00 AM - 08:00 AM	60.5	80.8	56.7
08:00 AM - 09:00 AM	59.8	78.6	56.2

Leq Average 24 hrs. (dB(A)) : 59.7
Lmax (dB(A)) : 90.4
L90 (dB(A)) : 55.2
Ldn (dB(A)) : 65.9

Standard (dB(A))

70

115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head



Analysis / Test Report



TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590820
Date Received : Nov 10, 2025
Date Reported : Nov 14, 2025
Report Number: 3450575-1

Page 1 of 1

Sample Number 2590820-4
Parameter Noise (Leq 24 hrs.)
Location บ้านนาบยา
Measurement Date Nov 01 - Nov 02, 2025
Measurement by Jakkarin Manwicha
Sound Level meter Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	54.7	80.5	47.7
11:00 AM - 12:00 PM	52.6	81.4	47.3
12:00 PM - 01:00 PM	52.6	76.0	45.8
01:00 PM - 02:00 PM	50.9	69.0	46.7
02:00 PM - 03:00 PM	59.1	85.8	47.6
03:00 PM - 04:00 PM	58.9	79.7	51.7
04:00 PM - 05:00 PM	57.0	76.9	50.9
05:00 PM - 06:00 PM	62.2	74.2	57.2
06:00 PM - 07:00 PM	61.7	76.2	53.3
07:00 PM - 08:00 PM	60.2	74.1	52.9
08:00 PM - 09:00 PM	56.7	71.9	50.3
09:00 PM - 10:00 PM	58.0	71.6	49.0
10:00 PM - 11:00 PM	64.2	73.6	49.5
11:00 PM - 12:00 AM	64.8	72.1	49.4
12:00 AM - 01:00 AM	65.2	72.8	49.0
01:00 AM - 02:00 AM	63.0	73.9	49.6
02:00 AM - 03:00 AM	57.5	71.1	47.4
03:00 AM - 04:00 AM	50.5	65.4	46.5
04:00 AM - 05:00 AM	57.3	80.0	45.4
05:00 AM - 06:00 AM	61.6	86.0	48.3
06:00 AM - 07:00 AM	54.4	83.1	47.7
07:00 AM - 08:00 AM	51.1	71.3	45.9
08:00 AM - 09:00 AM	59.0	85.9	45.6
09:00 AM - 10:00 AM	53.5	77.9	46.7

Leq Average 24 hrs. (dB(A)) 59.9
Lmax (dB(A)) 86.0
L90 (dB(A)) 47.7
Ldn (dB(A)) 67.9

Standard (dB(A)) 70 115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590820

Date Received : Nov 10, 2025
Date Reported : Nov 14, 2025
Report Number: 3450576-1

Page 1 of 1

Sample Number 2590820-5
Parameter Noise (Leq 24 hrs.)
Location บ้านนาบยา
Measurement Date Nov 02 - Nov 03, 2025
Measurement by Jakkarin Manwicha
Sound Level meter Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.0	84.8	48.3
11:00 AM - 12:00 PM	56.2	75.6	51.3
12:00 PM - 01:00 PM	58.5	82.6	48.4
01:00 PM - 02:00 PM	53.5	72.5	47.7
02:00 PM - 03:00 PM	53.0	70.6	49.8
03:00 PM - 04:00 PM	54.2	69.9	51.5
04:00 PM - 05:00 PM	60.4	70.1	52.2
05:00 PM - 06:00 PM	64.7	74.2	62.3
06:00 PM - 07:00 PM	62.6	76.0	56.9
07:00 PM - 08:00 PM	60.1	76.0	53.1
08:00 PM - 09:00 PM	57.3	70.4	52.0
09:00 PM - 10:00 PM	57.2	74.3	50.2
10:00 PM - 11:00 PM	60.9	72.0	50.1
11:00 PM - 12:00 AM	65.1	70.9	55.5
12:00 AM - 01:00 AM	65.5	73.4	54.0
01:00 AM - 02:00 AM	62.6	73.6	52.4
02:00 AM - 03:00 AM	55.8	75.2	51.6
03:00 AM - 04:00 AM	55.7	72.0	50.7
04:00 AM - 05:00 AM	60.1	85.0	50.3
05:00 AM - 06:00 AM	60.5	83.0	52.2
06:00 AM - 07:00 AM	56.6	80.1	50.2
07:00 AM - 08:00 AM	52.3	71.4	47.5
08:00 AM - 09:00 AM	50.1	66.9	46.4
09:00 AM - 10:00 AM	51.4	73.9	45.7

Leq Average 24 hrs. (dB(A)) 60.4
Lmax (dB(A)) 85.0
L90 (dB(A)) 50.7
Ldn (dB(A)) 67.8

Standard (dB(A)) 70 115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150

P/O : PMM-23-13

Project Name : Environmental Monitoring

Project Location :

Lot ID: 2590820

Date Received : Nov 10, 2025

Date Reported : Nov 14, 2025

Report Number: 3450577-1

Page 1 of 1

Sample Number 2590820-6
Parameter Noise (Leq 24 hrs.)
Location บ้านนาบยา
Measurement Date Nov 03 - Nov 04, 2025
Measurement by Jakkarin Manwicha
Sound Level meter Serial No. 233183

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	51.2	75.1	46.4
11:00 AM - 12:00 PM	51.8	75.0	45.9
12:00 PM - 01:00 PM	58.4	80.9	47.6
01:00 PM - 02:00 PM	64.1	89.2	49.5
02:00 PM - 03:00 PM	55.6	79.2	50.3
03:00 PM - 04:00 PM	56.1	76.4	51.6
04:00 PM - 05:00 PM	57.5	77.0	52.7
05:00 PM - 06:00 PM	59.9	74.0	56.0
06:00 PM - 07:00 PM	58.7	76.2	53.6
07:00 PM - 08:00 PM	55.6	71.7	51.8
08:00 PM - 09:00 PM	57.3	77.0	51.7
09:00 PM - 10:00 PM	54.7	72.8	51.2
10:00 PM - 11:00 PM	54.0	74.6	49.7
11:00 PM - 12:00 AM	52.2	68.6	49.3
12:00 AM - 01:00 AM	53.9	69.0	48.4
01:00 AM - 02:00 AM	51.4	67.8	48.1
02:00 AM - 03:00 AM	52.1	66.3	47.8
03:00 AM - 04:00 AM	51.2	69.7	47.9
04:00 AM - 05:00 AM	55.2	78.3	49.6
05:00 AM - 06:00 AM	58.6	88.7	52.0
06:00 AM - 07:00 AM	56.3	79.1	50.0
07:00 AM - 08:00 AM	52.0	69.9	47.2
08:00 AM - 09:00 AM	50.7	77.0	46.4
09:00 AM - 10:00 AM	50.2	69.2	45.8

Leq Average 24 hrs. (dB(A)) 56.5
Lmax (dB(A)) 89.2
L90 (dB(A)) 49.5
Ldn (dB(A)) 61.5

Standard (dB(A)) 70 115

Reference Method : ISO 1996-1 : 2016

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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คุณภาพอากาศภายในสถานประกอบการ



Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563655

Date Received : Aug 13, 2025
Date Reported : Aug 19, 2025
Report Number : 3350314-1

Page 1 of 5

Sample Number 2563655-1
Sampled Date Aug 13, 2025
Sample Description Air Quality
Location ไชระเหยออกจากถังซีลน้ำ (Water Seal)
Date Analysis Commenced Aug 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC *	10:15 AM - 10:35 AM	ppm	-	0.10	8.7	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563655

Date Received : Aug 13, 2025
Date Reported : Aug 19, 2025
Report Number : 3350314-1

Page 2 of 5

Sample Number 2563655-2
Sampled Date Aug 13, 2025
Sample Description Air Quality
Location ไหระเหยที่ออกจากขั้นตอนการนำสารที่ได้จากการทำให้บริสุทธิ์ถ่ายลงถังขนาด 200 ลิตร
Date Analysis Commenced Aug 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC *	10:15 AM - 10:35 AM	ppm	-	0.10	5.4	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563655

Date Received : Aug 13, 2025
Date Reported : Aug 19, 2025
Report Number : 3350314-1

Page 3 of 5

Sample Number 2563655-3
Sampled Date Aug 13, 2025
Sample Description Air Quality
Location ไหระเหยจากการถ่ายของเสียที่ไม่สามารถนำกลับมาใช้ได้เกิดจากกระบวนการลงสู่ถังขนาด 200 ลิตร
Date Analysis Commenced Aug 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC *	10:15 AM - 10:35 AM	ppm	-	0.10	33.3	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563655

Date Received : Aug 13, 2025
Date Reported : Aug 19, 2025
Report Number : 3350314-1

Page 4 of 5

Sample Number 2563655-4
Sampled Date Aug 13, 2025
Sample Description Air Quality
Location โรงระเหยขาดกลาก Carbon Absorber
Date Analysis Commenced Aug 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC *	10:15 AM - 10:35 AM	ppm	-	0.10	23.3	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

TESTING
No.0042

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2563655

Date Received : Aug 13, 2025
Date Reported : Aug 19, 2025
Report Number : 3350314-1

Page 5 of 5

Sample Number : 2563655-5
Sampled Date : Aug 13, 2025
Sample Description : Air Quality
Location : Cutter Zone
Date Analysis Commenced : Aug 14, 2025
Condition of Sample : Drawn into one filter paper placed in plastic cassette
Barometric Pressure : 753 mmHg
Atmospheric Temperature : 29.6 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total Dust	10:00 AM - 12:00 PM	mg/m3	-	0.15	<0.15	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NMAM, method 0500 Issue 2, 1994 (Include sampling)	OSHA	Rayong

Guideline :

OSHA : Occupational Safety and Health Administration

Sampled By : Prasanmit Kueanpet

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590829

Date Received : Nov 14, 2025
Date Reported : Nov 20, 2025
Report Number : 3415553-1

Page 1 of 5

Sample Number 2590829-1
Sampled Date Nov 13, 2025
Sample Description Air Quality
Location ไอระเหยออกจากถังซีลน้ำ (Water Seal)
Date Analysis Commenced Nov 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC	09:40 AM - 10:00 AM	ppm	-	0.10	2.5	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Santi Chaichana

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalermtamrong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590829

Date Received : Nov 14, 2025
Date Reported : Nov 20, 2025
Report Number : 3415553-1

Page 2 of 5

Sample Number 2590829-2
Sampled Date Nov 13, 2025
Sample Description Air Quality
Location ไธระเหยที่ออกจากขั้นตอนการนำสารที่ได้จากการทำให้บริสุทธิ์ถ่ายลงถังขนาด 200 ลิตร
Date Analysis Commenced Nov 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC	09:45 AM - 10:05 AM	ppm	-	0.10	27.3	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Santi Chaichana

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalermtamrong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590829

Date Received : Nov 14, 2025
Date Reported : Nov 20, 2025
Report Number : 3415553-1

Page 3 of 5

Sample Number 2590829-3
Sampled Date Nov 13, 2025
Sample Description Air Quality
Location ไธระเหยจากการถ่ายของเสียที่ไม่สามารถนำกลับมาใช้ได้เกิดจากกระบวนการลงสู่ถังขนาด 200 ลิตร
Date Analysis Commenced Nov 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC	09:50 AM - 10:10 AM	ppm	-	0.10	9.6	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Santi Chaichana

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalermtamrong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590829

Date Received : Nov 14, 2025
Date Reported : Nov 20, 2025
Report Number : 3415553-1

Page 4 of 5

Sample Number 2590829-4
Sampled Date Nov 13, 2025
Sample Description Air Quality
Location โรงระเหยมวลอากาศ Carbon Absorber
Date Analysis Commenced Nov 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total VOC	09:55 AM - 10:15 AM	ppm	-	0.10	13.9	No Standard	Total VOC Analyzer	-	Bangkok

Guideline :

Sampled By : Santi Chaichana

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalermtamrong
Scientist (4)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. The report shall not be reproduced except in full without the written approval of the laboratory.



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590829

Date Received : Nov 14, 2025
Date Reported : Nov 20, 2025
Report Number : 3415553-1

Page 5 of 5

Sample Number 2590829-5
Sampled Date Nov 13, 2025
Sample Description Air Quality
Location Cutter Zone
Date Analysis Commenced Nov 15, 2025
Condition of Sample Drawn into one 10-L air sampling bag
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.1 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Total Dust	09:30 AM - 11:30 AM	mg/m3	-	0.15	<0.15	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NMAM, method 0500 Issue 2, 1994 (Include sampling)	OSHA	Rayong

Guideline :

OSHA : Occupational Safety and Health Administration

Sampled By : Santi Chaichana

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Approved by

Saranya C.

Saranya Chalermthamrong
Scientist (4)

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ระดับเสียงภายในสถานประกอบการ



Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590831

Date Received : Nov 14, 2025
Date Reported : Nov 19, 2025
Report Number: 3454408-1

Page 1 of 1

Sample Number 2590831-1
Parameter Noise (Leq 8 hrs.)
Location บริเวณ Process 300
Measurement Date Nov 13, 2025
Measurement by Santi Chaichana

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:42 AM - 10:42 AM	79.1	85.1	78.6
10:42 AM - 11:42 AM	78.9	82.7	78.5
11:42 AM - 12:42 PM	79.6	81.7	79.0
12:42 PM - 01:42 PM	79.2	83.7	78.6
01:42 PM - 02:42 PM	79.4	90.2	78.8
02:42 PM - 03:42 PM	79.8	85.0	79.2
03:42 PM - 04:42 PM	79.8	89.5	79.1
04:42 PM - 05:42 PM	79.6	81.5	79.1

Leq Average 8 hrs. (dB(A)) 79.4
Lmax (dB(A)) 90.2
Standard (dB(A)) 90
Reference Method : ISO 1996-1 : 2016
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ. ๒๕๔๖

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
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Analysis / Test Report

Client : THAI MMA Co., Ltd.
88/6, 3191 Road, T. Map Ta Phut, A. Muang, Rayong Thailand 21150
P/O : PMM-23-13
Project Name : Environmental Monitoring
Project Location :

Lot ID: 2590831

Date Received : Nov 14, 2025
Date Reported : Nov 19, 2025
Report Number: 3454409-1

Page 1 of 1

Sample Number 2590831-2
Parameter Noise (Leq 8 hrs.)
Location บริเวณ Packing
Measurement Date Nov 13, 2025
Measurement by Santi Chaichana

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
09:41 AM - 10:41 AM	72.0	79.7	68.7
10:41 AM - 11:41 AM	72.4	84.9	69.0
11:41 AM - 12:41 PM	72.7	79.7	68.8
12:41 PM - 01:41 PM	72.3	80.4	69.1
01:41 PM - 02:41 PM	72.5	81.3	69.3
02:41 PM - 03:41 PM	72.7	86.2	69.1
03:41 PM - 04:41 PM	72.3	84.2	68.6
04:41 PM - 05:41 PM	71.7	89.1	68.5

Leq Average 8 hrs. (dB(A))

72.3

Lmax (dB(A))

89.1

Standard (dB(A))

90

140

Reference Method : ISO 1996-1 : 2016

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
ในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ. ๒๕๔๖

Technical Management

Chontichak

Chonticha Subongkoch
Scientist (3)

Approved by

Supot S

Supot Salamteh
Section Head

ADDRESS 616/10 Moo 5 T. Maenam Khu A. Pluakdaeng Rayong 21140 Thailand | PHONE +66 0 3304 8555 | FAX +66 0 3304 8556
ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company

Life Sciences

www.alsglobal.com

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ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0185	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0295	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0294	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	20-Feb-25	20-Feb-26	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0182	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0179	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0396	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	20-Feb-25	20-Feb-26	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0610	26-Jun-24	26-Dec-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0609	18-Jul-24	18-Jan-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0608	18-Jul-24	18-Jan-26	18
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0468	10-Jul-25	10-Jan-26	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS0472	10-Jul-25	10-Jan-26	6
Stack	Total Suspended Particulate	Fuel Gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	20-Feb-25	20-Feb-26	12
Stack	Butyl Acrylate	Pitot Tube	BKK_FS0473	10-Jul-25	10-Jan-26	6
Stack	Butyl Acrylate	Fuel Gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Butyl Acrylate	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Stack	Butyl Acrylate	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Butyl Acrylate	Air Sampling Pump	RYG_FS0131	4-Oct-25	4-Jan-26	3
Stack	Butyl Acrylate	Air Sampling Pump	RYG_FS0122	7-Oct-25	7-Jan-26	3
Stack	Butyl Acrylate	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Stack	Methyl Methacrylate	Pitot Tube	BKK_FS0473	10-Jul-25	10-Jan-26	6
Stack	Methyl Methacrylate	Fuel Gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Methyl Methacrylate	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Stack	Methyl Methacrylate	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Methyl Methacrylate	Air Sampling Pump	RYG_FS0131	4-Oct-25	4-Jan-26	3
Stack	Methyl Methacrylate	Air Sampling Pump	RYG_FS0121	3-Oct-25	3-Jan-26	3
Stack	Methyl Methacrylate	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Stack	Total VOCs as Propane	Pitot Tube	BKK_FS0473	10-Jul-25	10-Jan-26	6
Stack	Total VOCs as Propane	Fuel Gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Total VOCs as Propane	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Stack	Total VOCs as Propane	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Total VOCs as Propane	Air Sampling Pump	RYG_FS0131	4-Oct-25	4-Jan-26	3
Stack	Total VOCs as Propane	Air Sampling Pump	RYG_FS0122	7-Oct-25	7-Jan-26	3
Stack	Total VOCs as Propane	FID Analyzer	BKK_FS0758	1-Jul-25	1-Jan-26	6
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0213	16-Jan-25	16-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0022	19-Mar-25	19-Mar-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0024	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0496	19-Mar-25	19-Mar-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0019	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0018	21-Jan-25	21-Jan-26	12
Workplace	Total VOC	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Total VOC	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Total VOC	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total VOC	TVOC Analyzer	BKK_FS0820	9-Sep-24	9-Mar-26	18
Workplace	Total Dust	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total Dust	Digital Balance	RYG_EN0004	20-Feb-25	20-Feb-26	12



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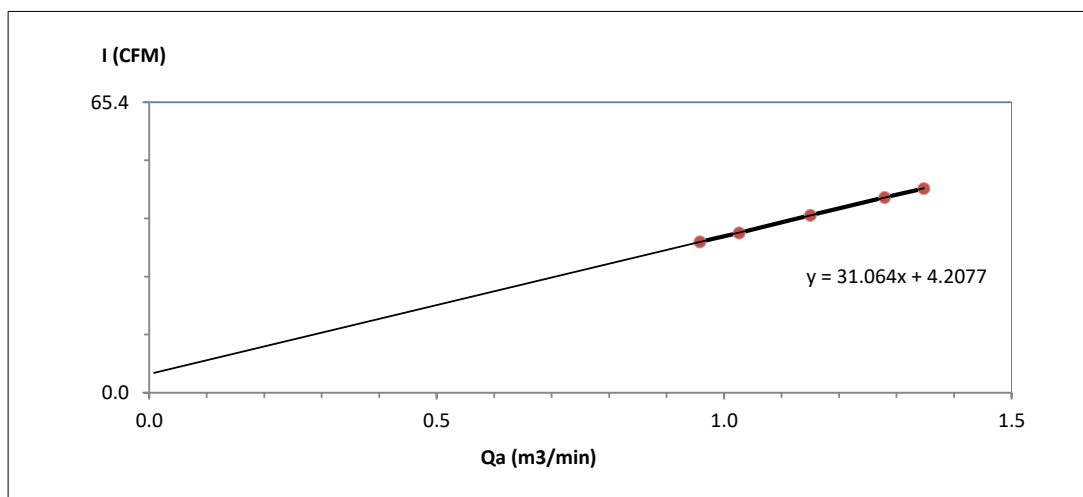
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	20-Jan-25	20-Jul-26	18
Rayong Lab	BOD	Incubator	RYG_EN0154	1-Nov-24	1-May-26	18
Rayong Lab	BOD	Burette	RYG_EN0216	18-Sep-25	18-Sep-26	12
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0003	20-Feb-25	20-Feb-26	12
Rayong Lab	Oil & Grease	Liquid Bath (Water)	RYG_EN0220	19-Dec-24	19-Dec-25	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	18-Jul-25	18-Jan-27	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0163	20-Feb-25	20-Feb-26	12
Rayong Lab	Total Suspended Solids	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0163	20-Feb-25	20-Feb-26	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Temperature	pH meter	RYG_FS0596	25-Jun-25	25-Jun-26	12



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	บ้านบน	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0185
CalibrationSheet No.:	C-011125-RYG_FS0185	High Volume Model :	TE-5009X
Calibrator ID:	RYG_FS0205	High Volume S/N :	4793
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95091
Calibrator S/N :	1166	Calibrator Intercept :	-0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.958	34	Slope : 31.0639 Intercept : 4.2077 Correlation Coefficient : 0.9999
2	2.3	1.026	36	
3	2.9	1.150	40	
4	3.6	1.279	44	
5	4.0	1.347	46	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

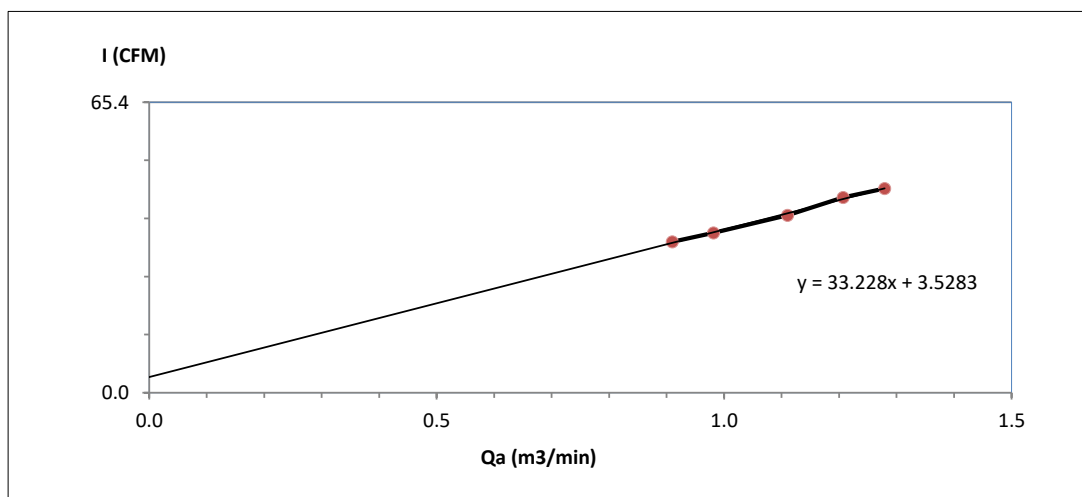
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	ระยอง	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0295
CalibrationSheet No.:	C-011125-RYG_FS0295	High Volume Model :	TE-5009X
Calibrator ID:	RYG_FS0205	High Volume S/N :	5502
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95091
Calibrator S/N :	1166	Calibrator Intercept :	-0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.910	34	Slope : 33.2283 Intercept : 3.5283 Correlation Coefficient : 0.9982
2	2.1	0.981	36	
3	2.7	1.110	40	
4	3.2	1.207	44	
5	3.6	1.279	46	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

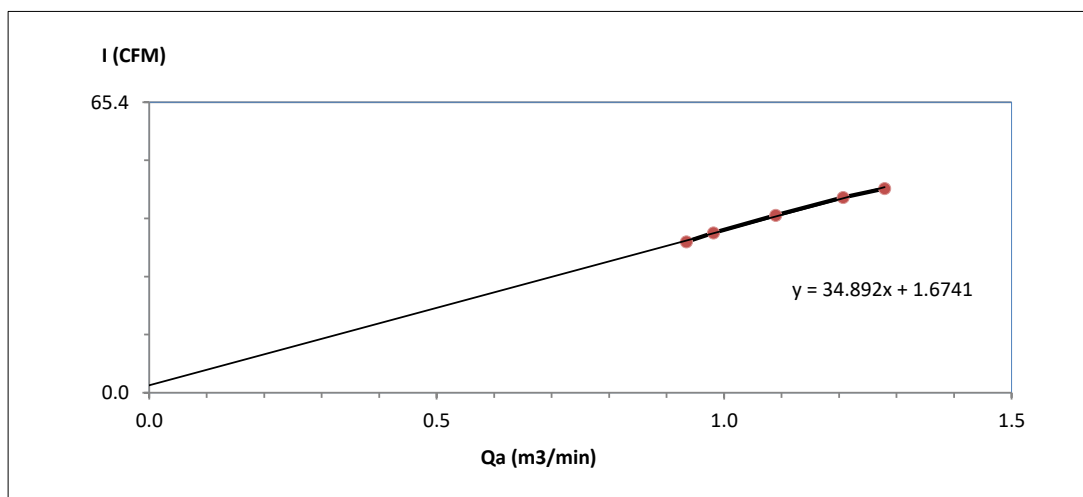
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	บ้านเนินพยอม	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0294
CalibrationSheet No.:	C-011125-RYG_FS0294	High Volume Model :	TE-5009X
Calibrator ID:	RYG_FS0205	High Volume S/N :	5501
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95091
Calibrator S/N :	1166	Calibrator Intercept :	-0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.9	0.934	34	Slope : 34.8921 Intercept : 1.6741 Correlation Coefficient : 0.9985
2	2.1	0.981	36	
3	2.6	1.090	40	
4	3.2	1.207	44	
5	3.6	1.279	46	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

(Mr. Supot Salamteh)
Field Services Section Head

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 25BKL0001

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	LA130S-F	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	25409664 RYG_EN0001	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY

Thanitak.

APPROVED BY.....

D. Johnson.

NEXT CAL DATE.....

20/02/26

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date 06 Mar 2025

Approval of the Calibration Certificate



Mr. Chonchai Inthana

Person in charge

Kachen Lalee

Calibration object

Single range instrument

Model	LA130S-F
Serial Number	25409664
QM Ident. no Inventory no.	RYG_EN0001 ---

Maximum capacity (Max. load)	150.0000 g
Measured range	150.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. ---
Building Floor	--- 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	24.5 °C 1.0 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 58.0 %RH.

Measurement results | Measurement uncertainties

Repeatability		
Test load (nominal): 10 g 100 g		
	10 g	100 g
1	10.0000 g	100.0000 g
2	9.9999 g	100.0000 g
3	10.0000 g	99.9999 g
4	10.0000 g	100.0000 g
5	10.0000 g	99.9999 g
6	9.9999 g	99.9999 g
7	10.0000 g	100.0000 g
8	10.0000 g	100.0000 g
9	10.0000 g	100.0000 g
10	10.0000 g	100.0000 g
	<i>s</i> = 0.00004 g	<i>s</i> = 0.00005 g

Eccentricity	
Test load (nominal): 50 g	
Center	50.0000 g
Front left	50.0001 g
Back left	50.0000 g
Back right	49.9999 g
Front right	50.0001 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.0500 g	0.0500 g	0.0000 g	2.00	0.00013 g	0.25 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
2.0000 g	2.0000 g	0.0000 g	2.00	0.00013 g	0.0065 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00069 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00021 g	0.00021 %
150.0000 g	149.9999 g	-0.0001 g	2.00	0.00028 g	0.00019 %
Maximum error of indication		$ E _{max} = 0.0001\text{ g}$			

*U*_{rel}(*E*) is the quotient of *U*(*E*) and test load *L*. The uncertainty of measurement *U*(*E*) is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-6}/\text{K}$

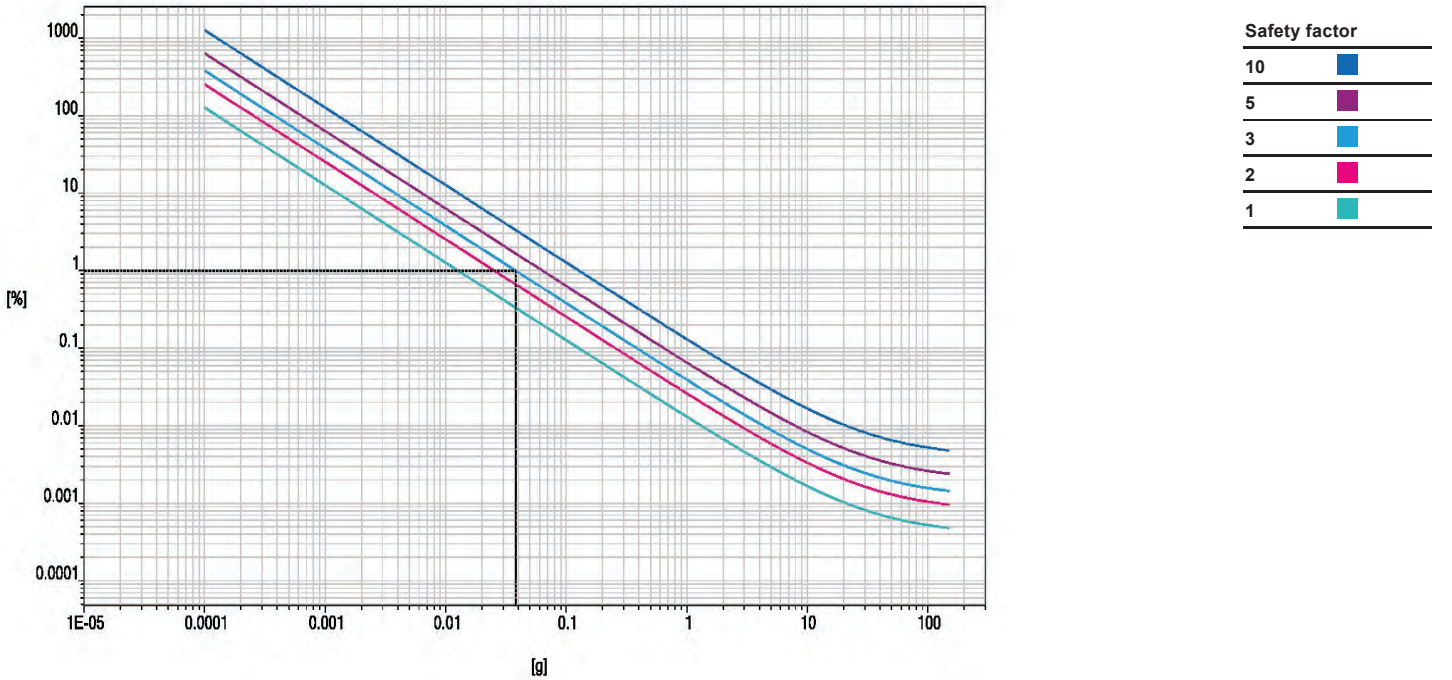
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 3.96 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	1.5000 g	0.00014 g	0.0091 %
25 %	37.5000 g	0.00028 g	0.00074 %
50 %	75.0000 g	0.00043 g	0.00057 %
75 %	112.5000 g	0.00058 g	0.00051 %
100 %	150.0000 g	0.00072 g	0.00048 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

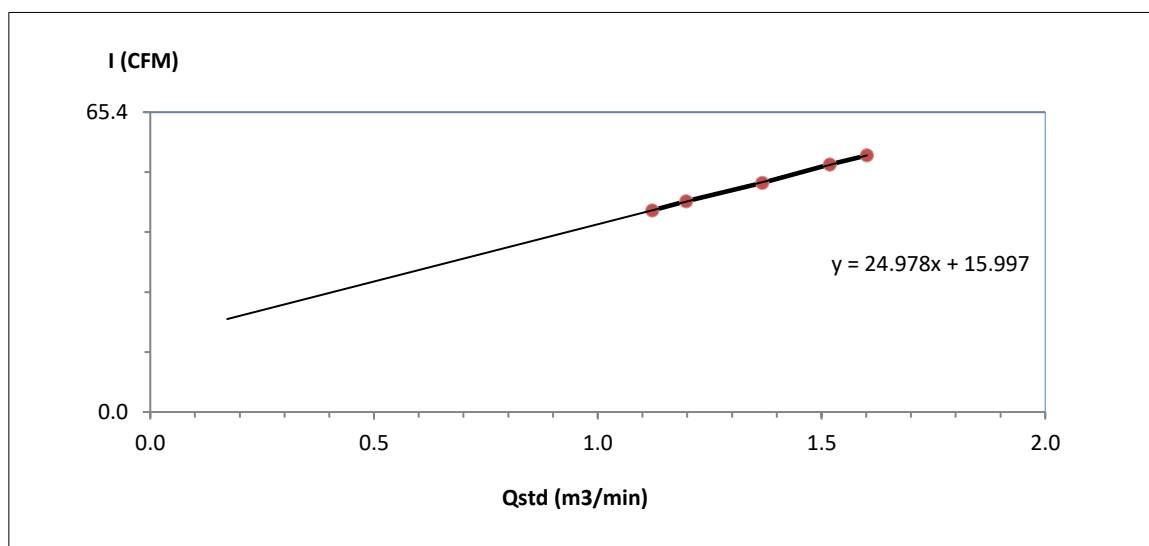
Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0380 g



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	บ้านน	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0182
CalibrationSheet No.:	C-011125-RYG_FS0182	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0205	High Volume S/N :	5335
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1220	44	Slope : 24.9777 Intercept : 15.9966 Correlation Coefficient : 0.9998
2	3.2	1.1974	46	
3	4.2	1.3674	50	
4	5.2	1.5182	54	
5	5.8	1.6017	56	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

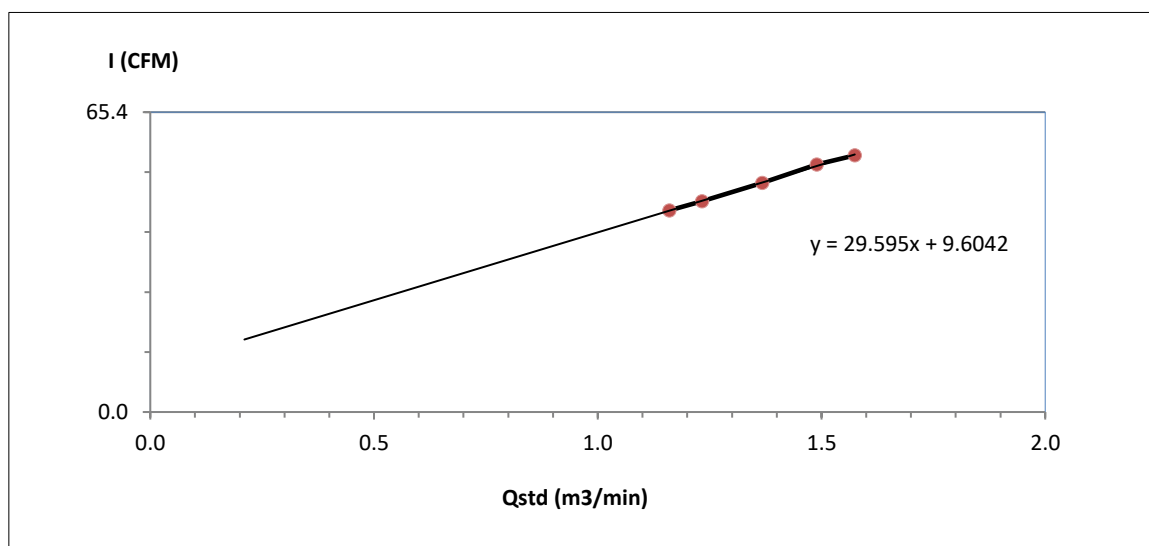
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	บ้านฉาง	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0179
CalibrationSheet No.:	C-011125-RYG_FS0179	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0205	High Volume S/N :	4805
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.0	1.1603	44	Slope : 29.5950 Intercept : 9.6042 Correlation Coefficient : 0.9992
2	3.4	1.2333	46	
3	4.2	1.3674	50	
4	5.0	1.4893	54	
5	5.6	1.5744	56	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

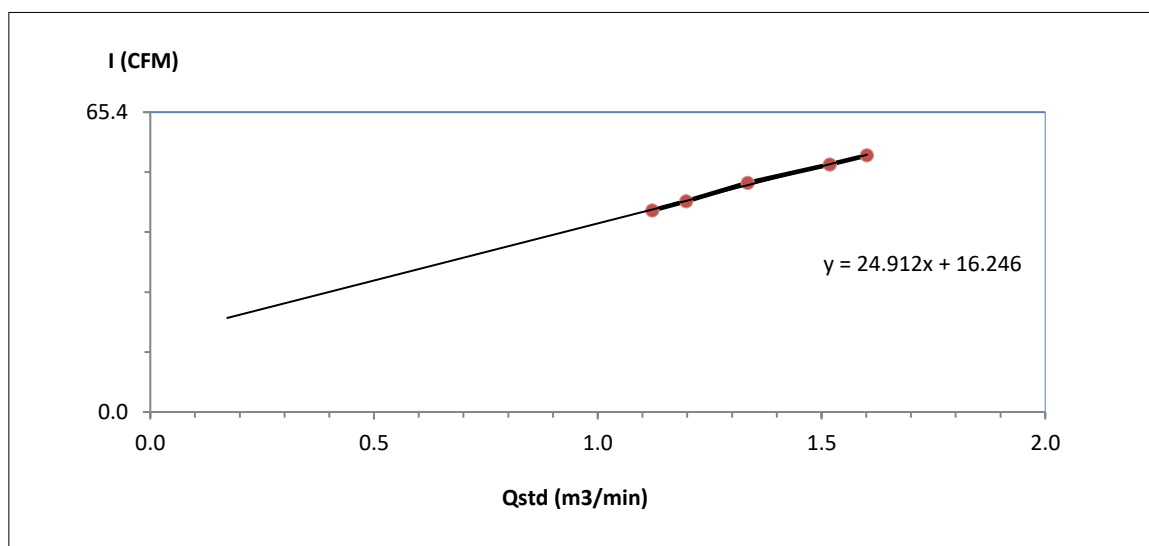
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	THAI MMA Co.,Ltd.	Barometric Pressure (mm Hg) :	759.3
Calibrate Location :	บ้านเนินพยอม	Temperature (°C) :	30.1
Calibrate Date :	1-Nov-25	High Volume ID :	RYG_FS0396
CalibrationSheet No.:	C-011125-RYG_FS0396	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0205	High Volume S/N :	5688
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1220	44	Slope : 24.9122 Intercept : 16.2465 Correlation Coefficient : 0.9985
2	3.2	1.1974	46	
3	4.0	1.3352	50	
4	5.2	1.5182	54	
5	5.8	1.6017	56	



Calibrated by

(Mr. Jakkarin Manwicha)
RYG Field Services Scientist (1)

Approved by :

(Mr. Supot Salamteh)
Field Services Section Head

Certificate Number

CWS-016-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5911
Data logger: A5911
ID NUMBER : RYG_FS0610
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 26 Jun 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 100 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.111 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.6) °C, (41.4) %RH and (1002.0) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittrapor Lertsomphol



Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

Calibration procedure:

The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0007-24 and MW-0055-23

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'

REVIEW BY

Marakorn P

APPROVED BY

26/12/25

NEXT CAL. DATE

Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

MEASUREMENT RESULTS⁵

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 round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V_{std}^6 (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC}^7 (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.993	24.50	24.60	0.8	-0.2	0.31
2.014	24.70	24.60	1.7	-0.3	0.31
2.985	24.68	24.60	2.8	-0.2	0.31
4.131	24.64	24.60	3.8	-0.3	0.31
4.97	24.50	24.60	4.9	-0.1	0.31
5.98	24.46	24.60	6.0	0.0	0.31
7.04	24.50	24.60	7.1	0.0	0.31
7.96	24.32	24.60	8.1	0.1	0.31
9.02	24.70	24.60	9.1	0.1	0.31
9.98	24.30	24.60	10.2	0.2	0.31
11.02	24.70	24.60	11.3	0.3	0.31
11.99	24.30	24.60	12.3	0.3	0.31
13.03	24.70	24.60	13.3	0.3	0.31
14.05	24.30	24.60	14.4	0.4	0.31
15.05	24.70	24.60	15.4	0.4	0.31
15.99	24.46	24.60	16.4	0.4	0.31

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP

Calibration set-up of the Cup anemometer calibration 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 true to scale due to imaging geometry.



Certificate Number

CWD-016-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-SD-L-0
SERIAL NUMBER : Sensor: WSD-AS911
Data logger: AS911
ID NUMBER : RYG_FS0610
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 26 Jun 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION	: Wind tunnel cross-section area ¹	900	cm ²
	Wind direction frontal area ²	129	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.0)°C, (53.0) %RH and (1005.2) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset 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 m/s	D^{std} Degree (°)	D^{uuc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
5.00	0.000	0	0	0.80
	45.000	45	0	0.80
	90.000	89	-1	0.80
	135.000	132	-3	0.80
	180.000	177	-3	0.80
	225.000	223	-2	0.80
	270.000	270	0	0.80
	315.000	318	3	0.80

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Pressure measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CPR-006-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Digital barometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: 110-WS-25BP
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: BP-A5911
Data logger: A5911
ID NUMBER : RYG_FS0610
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.
RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 26 Jun 2024

Calibration procedure:

The Digital barometer was calibrated against Digital pressure calibrator. The WI-CL-003 was used as a calibration guideline.

Traceability:

The measurement results are traceable to the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MP-0009-24

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'

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date
Absolute Pressure Transducer	CPG2500	4100126P	MP-0009-24	27 Dec 2024

1. Calibration effort for calibration sequence B

2. The UUC* was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.

3. Calibration conditions:

4. Condition : ☒ Normal ☐ Abnormal

Pressure transmitting medium : Air

ρ_{F1} (20°C, 1 bar) : 1.19 kg/m³

H_{amb} : (55±15) %

t_{amb} : (23±3) °C

p_{amb} : (1010±10) mbar

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

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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



Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-006-67

Page 2 of 2 Pages

MEASUREMENT RESULTS : ☐ Without adjustment ☒ With adjustment

CALIBRATION IN THE RANGE OF : 950 mbar to 1050 mbar

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

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.15	951.6	1.5	0.37
970.11	971.0	0.9	0.37
990.06	990.7	0.7	0.37
1010.08	1010.4	0.3	0.37
1030.07	1030.1	0.0	0.37
1050.07	1049.8	-0.3	0.37

Note: UUC* Unit Under Calibration

: To convert the result in report unit to Pa should be multiply by 100

End of certificate





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Temperature measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-103-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25DL-D
SERIAL NUMBER : A5911
ID NUMBER : RYG_FS0610
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 26 Jun 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: ER-0101-23

Reference Used During Calibration:

1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 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 GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory: _____

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number CDT-103-67

Page 2 of 2 Pages

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: HMP60 S/N: U3911245.
Dimension: Diameter 12 mm. Length 80 mm.

<u>Immersion Depth</u> (mm)	<u>Standard Reading</u> (°C)	<u>UUC Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (°C)
80	20.054	19.8	-0.2	0.16
80	25.051	24.8	-0.2	0.16
80	30.046	29.9	-0.1	0.099
80	35.034	34.8	-0.2	0.099
80	40.043	39.8	-0.2	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Relative humidity and Air Temperature measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CRT-015-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novalynx
MODEL/TYPE : Data Logger: 110-WS-25DL-D
Sensor: HMP60
SERIAL NUMBER : Data Logger: A5911
Sensor: U3911245
ID NUMBER : RYG_FS0610
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 10 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 26 Jun 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Relative humidity and Air Temperature calibration was done by In-House calibration method as WI-CL-009 and WI-CL-010 according to comparison method with Standard Chilled Mirror hygrometer with Temperature sensor and standard Humidity generator chamber.

Traceability:

The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: TH-0079-23 and through Jiranatee Associates Co., Ltd. Certificate number: CDT-001-67.

Uncertainty of Measurement:

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

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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: 20%RH to 80%RH

<u>Air Temperature</u> (°C)	<u>Standard Reading</u> (%RH)	<u>UUC Reading</u> (%RH)	<u>Error</u> (%RH)	<u>Uncertainty</u> ± (%RH)
29.80	19.61	17.6	-2.0	0.83
29.80	50.48	47.4	-3.0	1.3
29.81	81.62	77.5	-4.1	2.3

UUC*: Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Air speed measurement laboratory
Calibration services department.



NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number

CWS-026-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5910
Data logger: A5910
ID NUMBER : RYG_FS0609
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 100 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.111 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.8) °C, (44.9) %RH and (1003.3) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Calibration procedure:

The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0007-24 and MW-0055-23

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'

REVIEW BY *Margaloni P*

APPROVED BY *Wichit Ch*

NEXT CAL. DATE 18/1/26

Approved signatory: *Mr. Parinya Booncharoen*

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

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 ⁵

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 round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{std}^6 (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{uuc}^7 (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.997	23.70	23.80	0.9	-0.1	0.31
2.021	23.90	23.80	1.8	-0.2	0.31
2.990	23.70	23.80	2.9	-0.1	0.31
4.094	23.70	23.80	3.8	-0.3	0.31
4.97	23.72	23.80	5.0	0.0	0.31
5.97	23.60	23.80	6.0	0.0	0.31
7.04	23.80	23.80	7.0	0.0	0.31
7.98	23.62	23.80	8.0	0.0	0.31
9.00	23.72	23.80	9.1	0.1	0.31
9.98	23.50	23.80	10.1	0.1	0.31
10.97	23.70	23.80	11.1	0.1	0.31
12.04	23.50	23.80	12.1	0.1	0.31
12.96	23.80	23.80	13.1	0.1	0.33
14.10	23.50	23.80	14.2	0.1	0.31
15.04	23.70	23.80	15.2	0.2	0.31
15.97	23.60	23.80	16.2	0.2	0.31

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP

Calibration set-up of the Cup anemometer calibration 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 true to scale due to imaging geometry.

End of Certificate of Calibration

NAC

JIRANATEE ASSOCIATES CO., LTD.

Certificate Number

CWD-026-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5910
Data logger: A5910
ID NUMBER : RYG_FS0609
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION	: Wind tunnel cross-section area ¹	900	cm ²
	Wind direction frontal area ²	129	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (22.2)°C, (47.5) %RH and (1001.7) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model: AX4009TS-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0036-23.

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'

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset 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 m/s	D^s_{std} Degree (°)	D^7_{unc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
5.04	0.000	0	0	0.80
	45.000	44	-1	0.80
	90.000	87	-3	0.80
	135.000	131	-4	0.80
	180.000	176	-4	0.80
	225.000	222	-3	0.80
	270.000	272	2	0.80
	315.000	320	5	0.80

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd.Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Temperature measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-121-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25DL-D
SERIAL NUMBER : A5910
ID NUMBER : RYG_FS0609
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: ER-0101-23

Reference Used During Calibration:

1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 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 GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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: HMP60 S/N: U3641223.
Dimension: Diameter 12 mm. Length 80 mm.

<u>Immersion Depth</u> (mm)	<u>Standard Reading</u> (°C)	<u>UUC Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (°C)
80	20.047	19.6	-0.4	0.099
80	25.043	24.6	-0.4	0.099
80	30.034	29.7	-0.3	0.099
80	35.028	34.7	-0.3	0.099
80	40.018	39.5	-0.5	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd.Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Relative humidity and Air Temperature measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CRT-023-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novalynx
MODEL/TYPE : Data Logger: 110-WS-25DL-D
Sensor: HMP60
SERIAL NUMBER : Data Logger: A5910
Sensor: U3641223
ID NUMBER : RYG_FS0609
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Relative humidity and Air Temperature calibration was done by In-House calibration method as WI-CL-009 and WI-CL-010 according to comparison method with Standard Chilled Mirror hygrometer with Temperature sensor and standard Humidity generator chamber.

Traceability:

The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: TH-0079-23 and through Jiranatee Associates Co., Ltd. Certificate number: CDT-001-67.

Uncertainty of Measurement:

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

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number: CRT-023-67

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

Calibration Range: 20%RH to 80%RH

<u>Air Temperature</u> (°C)	<u>Standard Reading</u> (%RH)	<u>UUC Reading</u> (%RH)	<u>Error</u> (%RH)	<u>Uncertainty</u> ± (%RH)
29.79	19.50	17.7	-1.8	0.83
29.83	50.52	47.9	-2.7	1.3
29.80	81.80	78.0	-3.8	2.3

UUC*: Unit Under Calibration

End of Certificate of Calibration



Certificate Number

CWS-025-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5909
Data logger: A5909
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 100 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.111 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.5) °C, (43.4) %RH and (1006.7) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

Calibration procedure:

The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0007-24 and MW-0055-23

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'

REVIEW BY

Narakorn P.

APPROVED BY

Nichol

NEXT CAL. DATE

48/1/26

Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

MEASUREMENT RESULTS⁵

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 round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{std} ⁶ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{uuc} ⁷ (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.997	24.78	24.45	0.8	-0.2	0.31
2.014	24.20	24.45	1.8	-0.2	0.31
2.990	24.80	24.45	2.9	-0.1	0.31
4.102	24.80	24.45	3.8	-0.3	0.31
4.97	24.80	24.45	5.0	0.0	0.31
5.98	24.50	24.45	6.0	0.0	0.31
7.03	24.70	24.45	7.1	0.1	0.31
7.95	24.38	24.45	8.1	0.1	0.31
9.04	24.70	24.45	9.1	0.1	0.31
9.98	24.36	24.45	10.2	0.2	0.31
10.99	24.80	24.45	11.2	0.2	0.31
12.03	24.40	24.45	12.2	0.2	0.31
12.97	24.70	24.45	13.2	0.2	0.31
14.10	24.50	24.45	14.3	0.2	0.31
15.03	24.70	24.45	15.2	0.2	0.31
15.99	24.58	24.45	16.2	0.2	0.31

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration 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 true to scale due to imaging geometry.



Certificate Number

CWD-025-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5909
Data logger: A5909
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION	: Wind tunnel cross-section area ¹	900	cm ²
	Wind direction frontal area ²	129	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (22.4)°C, (43.3) %RH and (1004.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

Calibration procedure:

The wind direction sensor was calibrated against Standard Rotary Encoder model: AX4009TS-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0036-23.

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'

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset 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 m/s	D^{std} Degree (°)	D^{uuc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
5.04	0.000	0	0	0.80
	45.000	41	-4	0.80
	90.000	87	-3	0.80
	135.000	132	-3	0.80
	180.000	178	-2	0.80
	225.000	225	0	0.80
	270.000	272	2	0.80
	315.000	319	4	0.80

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Temperature measurement laboratory
Calibration services department.



NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-120-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25DL-D
SERIAL NUMBER : A5909
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: ER-0101-23

Reference Used During Calibration:

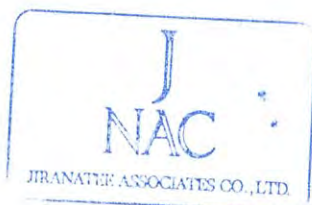
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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 GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory: _____

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number CDT-120-67

Page 2 of 2 Pages

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: HMP60 S/N: U3641220.
Dimension: Diameter 12 mm. Length 80 mm.

<u>Immersion Depth</u> (mm)	<u>Standard Reading</u> (°C)	<u>UUC Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (°C)
80	20.047	19.8	-0.2	0.099
80	25.043	24.8	-0.2	0.099
80	30.034	29.8	-0.2	0.099
80	35.028	34.8	-0.2	0.099
80	40.018	39.7	-0.3	0.16

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Relative humidity and Air Temperature measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CRT-022-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novalynx
MODEL/TYPE : Data Logger: 110-WS-25DL-D
Sensor: HMP60
SERIAL NUMBER : Data Logger: A5909
Sensor: U3641220
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Relative humidity and Air Temperature calibration was done by In-House calibration method as WI-CL-009 and WI-CL-010 according to comparison method with Standard Chilled Mirror hygrometer with Temperature sensor and standard Humidity generator chamber.

Traceability:

The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: TH-0079-23 and through Jiranatee Associates Co., Ltd. Certificate number: CDT-001-67.

Uncertainty of Measurement:

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

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number: CRT-022-67

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

Calibration Range: 20%RH to 80%RH

<u>Air Temperature</u> (°C)	<u>Standard Reading</u> (%RH)	<u>UUC Reading</u> (%RH)	<u>Error</u> (%RH)	<u>Uncertainty</u> ± (%RH)
29.79	19.49	17.5	-1.9	0.83
29.82	50.54	47.3	-3.3	1.3
29.81	81.68	77.1	-4.6	2.3

UUC*: Unit Under Calibration

End of Certificate of Calibration





CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 10-Jul-25
Next Cal. Date : 10-Jan-26

Barometric Pressure (mmHg) : 751.3
Relative Humidity (%) : 43.7
Temperature (C°) : 27.1

Console Control Meter Data

Calibration No. : C-100725-BKK_FS0468
Dry Gas Meter ID : BKK_FS0468
Serial No. : 1302005
Model No. : XC-572-V

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID : BKK_FS1122
Serial No. : A2003240
Correction Factor (Y) : 1.0000
Next Calibration Date : 25 Feb 26

ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration				Console Control ; Drygas Meter						Dry Gas Meter	Orifice
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg.Tm (°C)	Correction	Calibration
		Final	Initial	Total		Final	Initial	Total				Factor (Y)	Factor $\Delta H@$
15	12.21	150.00	0.00	150.00	27.0	792201.0	792056.0	145.00	27.0	27.0	27.0	1.0330	45.6797
25	9.23	150.00	0.00	150.00	27.0	792353.0	792207.0	146.00	27.0	27.0	27.0	1.0249	43.5055
50	6.50	150.00	0.00	150.00	28.0	792497.0	792357.0	140.00	28.0	28.0	28.0	1.0662	43.2955
80	5.09	150.00	0.00	150.00	28.0	792658.0	792511.0	147.00	28.0	28.0	28.0	1.0125	42.4787
120	4.11	150.00	0.00	150.00	28.0	792817.0	792670.0	147.00	29.0	29.0	29.0	1.0119	41.4067
											Avg.	1.0297	43.2732

Y : Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average .

$\Delta H@$: Orifice pressure differential that equates to 21.24 lm of air @ 25 C and 760 mm of mercury , mmH₂O ; tolerance for individual values ± 5.08 from average .

Procedure; 40 CFR 60,APP A,METH ,SEC 5.3 & 7

Calibrated by:

(Mr. Warawut Pubpa)

RYG Field Service Scientist(3)

Approved by:

(Mr.Natthapol Jiengwareewong)

RYG Field Service Specialist(



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	10 Jul 25	Ambient Temperature (°C)	43.7
Calibration sheet No. :	C-100725-BKK_FS0469	Relative Humidity (%) :	27
Digital Temperature ID :	BKK_FS0469	Reference Temperature ID	BKK_FS1144
Serial No. :	1302005	Serial No. :	201090006013
Model :	XC-572-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	5 Jan 26

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	3	3	±3	Pass
	25	27	2	±3	Pass
	50	51	1	±3	Pass
	100	100	0	±3	Pass
	150	148	-2	±3	Pass
	200	198	-2	±3	Pass
	250	247	-3	±3	Pass
	300	298	-2	±3	Pass
	500	497	-3	±3	Pass
Probe	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	139	-1	±3	Pass
Oven	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	139	-1	±3	Pass
Filter	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	139	-1	±3	Pass
Exit	0	1	1	±3	Pass
	10	11	1	±3	Pass
	20	21	1	±3	Pass
Meter	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass
AUX	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by :

(Mr. Warawut Pubpa)

RYG Field Service Scientist (3)

Approved by :

(Mr. Natthapol Jiengwareewong)

RYG Field Service Specialist (1)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 10 Jul 25	Nozzle Set ID. : BKK_FS0474
Calibration Sheet No. : C-100725-BKK_FS0474	Vernier Caliper ID.: RYG_FS0539

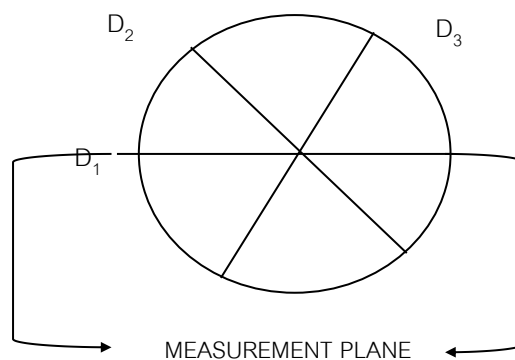
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.305	0.300	0.302	0.005	0.302
2	0.451	0.455	0.453	0.004	0.453
3	0.540	0.545	0.535	0.010	0.540
4	0.601	0.602	0.601	0.001	0.601
5	0.758	0.765	0.766	0.008	0.763
6	0.935	0.934	0.935	0.001	0.935
7	1.095	1.092	1.092	0.003	1.093
8	1.260	1.259	1.260	0.001	1.260
9	1.605	1.601	1.610	0.009	1.605

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by : _____

(Mr. Warawut Pubpa)

RYG Field Services Scientist (3)

Approved by : _____

Nattapol Jiengwareewong

(Mr.Nattapol Jiengwareewong)

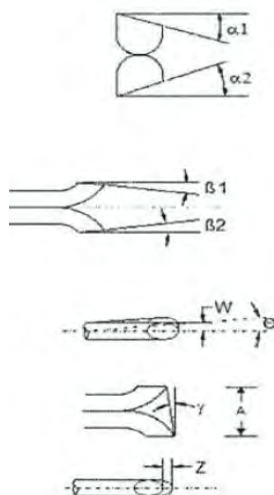
RYG Field Services Specialist (1)



Type S Pitot Tube Calibration


Date Calibration 10-Jul-25
Pitot ID BKK_FS0472
Pitot SN

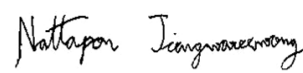
Due Date 10-Jan-26
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539



Parameter	Value	Allowable Range	Check
$\alpha 1$	0.9	$-10^{\circ} < \alpha 1 < +10^{\circ}$	OK
$\alpha 2$	3.2	$-10^{\circ} < \alpha 2 < +10^{\circ}$	OK
$\beta 1$	-2.3	$-5^{\circ} < \beta 1 < +5^{\circ}$	OK
$\beta 2$	-0.3	$-5^{\circ} < \beta 2 < +5^{\circ}$	OK
γ	1	-	-
θ	1.9	-	-
$Z = A \tan \gamma$	0.016	$Z \leq 0.125"$	OK
$W = A \tan \theta$	0.030	$W \leq 0.031"$	OK
Dt	0.310	0.188" to 0.375"	OK
$A/2Dt$	1.452	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.9	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/porbe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84 . See 40 CFR Pt. 60, App. A,EPA Method 2.

Calibrated by : 
 (Mr. Warawut Pubpa)
 RYG Field Services Scientist (3)

Approved By : 
 (Mr. Natthapol Jiengwareewong)
 RYG Field Services Specialist (1)

Certificate No: G 680111

Date of issue : 19-Feb-25

Instrument description : Flue Gas Analyzer
Instrument model : Testo 340
Control unit serial no. : -
Instrument serial no. : 62150585
ID no. or control no. : RYG_FS0465
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-250514
Receiving date. : 18-Feb-25
Parameter of calibration : Gas Calibration(Oxygen 2.50,9.984,21.02 %vol, Carbon Monoxide 80.45,302,1007 ppm, Nitric Oxide 30.0,151.8,322.5 ppm, Sulphur Dioxide 50.36,100.7,600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
 Temperature : 23 ±5 °C
 Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

REVIEW BY Supt S

APPROVED BY [Signature]

NEXT CAL DATE 18/ 02/ 2026

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

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 19-Feb-25

Kwanchai

Mr. Kwanchai Khamdoug

Calibration Technician

[Signature]

Mrs. Nongluck Wongsettee

Technical Manager

Certificate No.: G 680111

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 9.984 % Vol	CG-0113-24	Nimt	01-Aug-29
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.45 ppm	CG-0132-24	Nimt	10-Sep-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1007 ppm	1870/24	Linde	17-Jun-26
Nitric Oxide (NO) 30.0 ppm	CG-0065-24	Nimt	06-May-26
Nitric Oxide (NO) 151.8 ppm	0404/25	Linde	09-Feb-27
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.9 °C Humidity : 66.4 %RH Pressure : 1010.8 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 700 ml/min Gas pressure : 1014.5 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.44	-0.06	0.15
O ₂ (%Vol)	9.984	9.91	-0.074	0.20
O ₂ (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.45	81	0.55	3.0
CO (ppm)	302	301	-1	6.0
CO (ppm)	1007	1005	-2	12
NO (ppm)	30.0	32	2.0	8.0
NO (ppm)	151.8	154	2.2	8.0
NO (ppm)	322.5	323	0.5	12
SO ₂ (ppm)	50.36	49	-1.36	6.0
SO ₂ (ppm)	100.7	101	0.3	6.0
SO ₂ (ppm)	600.8	603	2.2	13

Remark : 1 cmol/mol = 1 %vol, 1 µmol/mol = 1 ppm.

End of Report

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 25BKL0003

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY

Thanitak.

APPROVED BY

D. Khunon.

NEXT CAL DATE

20/02/26

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date 06 Mar 2025

Approval of the Calibration Certificate



Mr. Chonchai Inthana

Person in charge

Kachen Lalee

Calibration object

Single range instrument

Model	MSU224S-100-DU
Serial Number	31709552
QM Ident. no Inventory no.	RYG_EN0003 ---

Maximum capacity (Max. load)	220.0000 g
Measured range	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. ---
Building Floor	--- 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	24.7 °C 0.3 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 62.3 %RH.

Measurement results | Measurement uncertainties

Repeatability			Eccentricity	
Test load (nominal): 10 g 200 g			Test load (nominal): 100 g	
	10 g	200 g		
1	10.0000 g	200.0000 g	Center	
2	10.0000 g	200.0001 g	Front left	
3	9.9999 g	200.0000 g	Back left	
4	10.0000 g	200.0000 g	Back right	
5	10.0000 g	200.0001 g	Front right	
6	9.9999 g	200.0000 g	Maximum deviation from centric loading indication	
7	10.0000 g	200.0000 g	Δ _{ecc} max = 0.0001 g	
8	10.0000 g	200.0000 g		
9	10.0000 g	200.0000 g		
10	10.0000 g	200.0001 g		
	<i>s</i> = 0.00004 g	<i>s</i> = 0.00005 g		

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		<i>E</i> _{max} = 0.0001 g			

*U*_{rel}(*E*) is the quotient of *U*(*E*) and test load *L*. The uncertainty of measurement *U*(*E*) is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-6}/\text{K}$

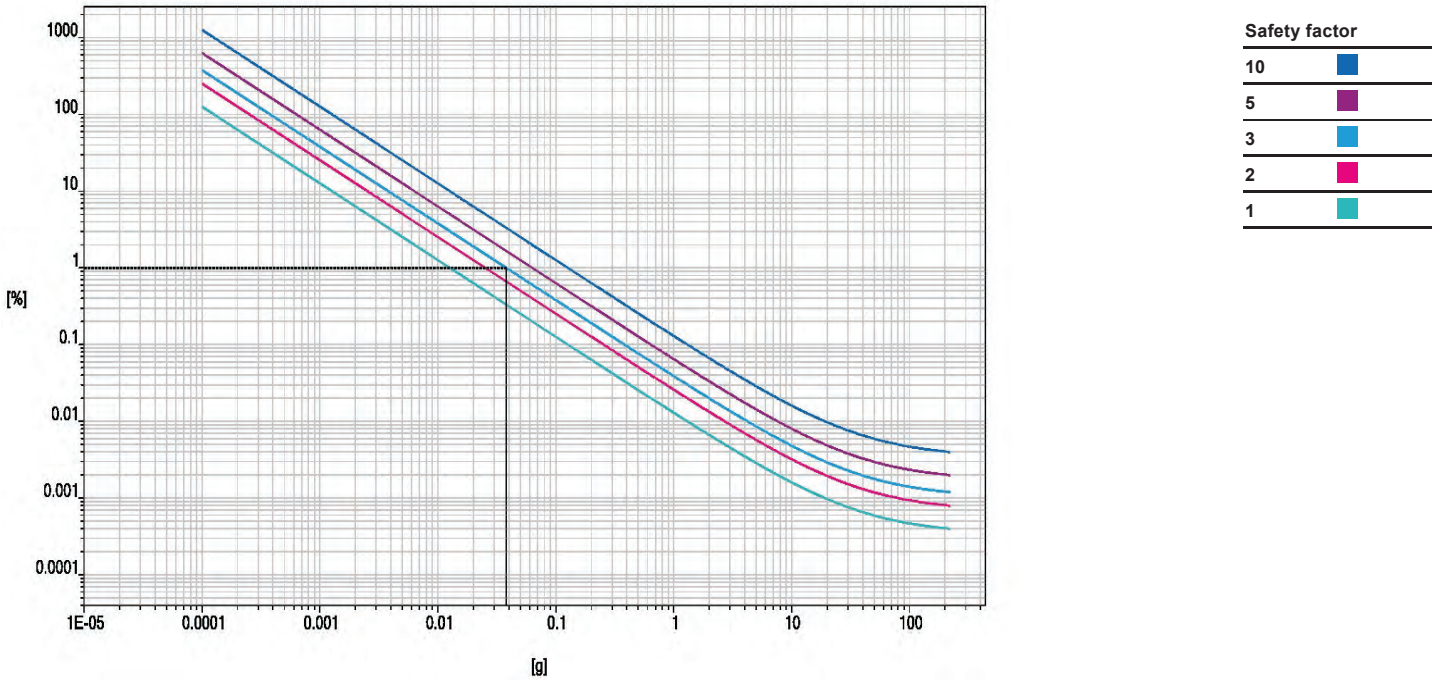
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 3.42 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00014 g	0.0063 %
25 %	55.0000 g	0.00032 g	0.00058 %
50 %	110.0000 g	0.00051 g	0.00046 %
75 %	165.0000 g	0.00069 g	0.00042 %
100 %	220.0000 g	0.00088 g	0.00040 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

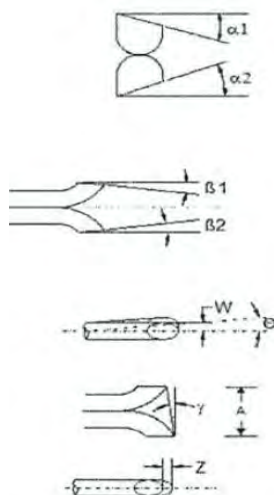
Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0380 g



Type S Pitot Tube Calibration

Date Calibration 10-Jul-25
Pitot ID BKK_FS0473
Pitot SN _

Due Date 10-Jan-26
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539



Parameter	Value	Allowable Range	Check
$\alpha 1$	-2.3	$-10^\circ < \alpha 1 < +10^\circ$	OK
$\alpha 2$	-1.2	$-10^\circ < \alpha 2 < +10^\circ$	OK
$\beta 1$	-2	$-5^\circ < \beta 1 < +5^\circ$	OK
$\beta 2$	1.2	$-5^\circ < \beta 2 < +5^\circ$	OK
γ	0.3	-	-
θ	0.2	-	-
$Z = A \tan \gamma$	0.005	$Z \leq 0.125''$	OK
$W = A \tan \theta$	0.003	$W \leq 0.031''$	OK
Dt	0.320	0.188" to 0.375"	OK
$A/2Dt$	1.438	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.92	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/porbe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84 . See 40 CFR Pt. 60, App. A,EPA Method 2.

Calibrated by :

(Mr. Warawut Pubpa)
 RYG Field Services Scientist (3)

Approved By :

(Mr. Natthapol Jiengwareewong)
 RYG Field Services Specialist (1)

Certificate of Calibration

Customer

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

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Accuracy : 1% of Reading

Model : 200-510L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 January 2025

Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY 

APPROVED BY 

NEXT CAL DATE.....26/01/26.....

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

Calibration By :



Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :



Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date :

27 January 2025

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
 Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Decision Rule for Statements of Conformity

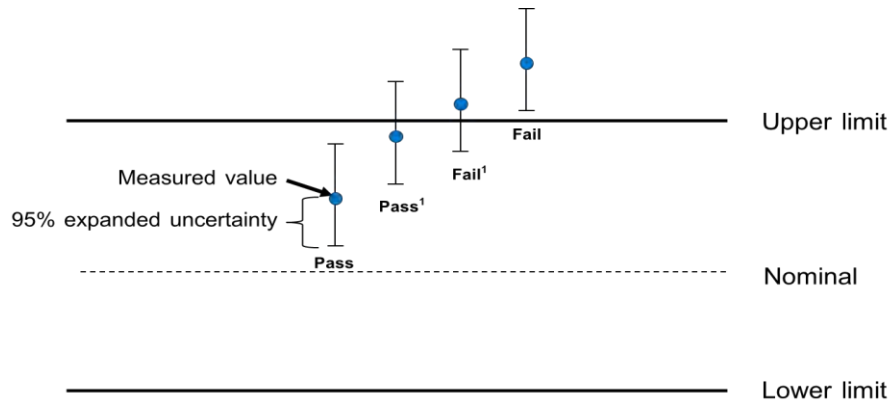
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate



Certificate of Calibration

Customer

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

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510M
Serial Number : 151114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY	<i>Narakon P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	09/09/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qreborn	15 October 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01 and MIT NSC-TISI-TIS Accreditation No. 0052

Note :

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

Calibration By :

[Signature]

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

[Signature]

Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date :

10 September 2025

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Result of Calibration : Without Adjustment

STD Reading			UUC Readingg			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.98	100	-	-	100.02	0.0	3.6	1.0	0.50
25.7	100.97	503	-	-	500.81	-2.2	9.5	1.0	0.50
25.8	100.89	1003	-	-	1000.4	-3	19	1.0	0.50
26.1	100.88	2000	-	-	2001.9	2	38	1.0	0.50
26.5	100.85	3014	-	-	3002.2	-12	57	1.0	0.50
26.7	100.81	4027	-	-	4000.9	-26	76	1.0	0.50
27.0	100.74	5048	-	-	5001.8	-46	95	1.0	0.50

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition, Air ☐

- Flow Rate was corrected for non-standard operating condition by using equation :

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

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate



Certificate of Calibration

Certificate No. C-041025-RYG_FS0131

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0131
Serial No. : 20150410007
Calibration Date : 04-Oct-25
Next calibration date : 04-Jan-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.2	20.4	19.4	19.7	5%	19 - 21	Passed
50	50.8	50.7	50.9	50.8	5%	48 - 53	Passed
100	99.3	98.9	99.0	99.1	5%	95 - 105	Passed
200	200.0	199.8	200.3	200.0	5%	190 - 210	Passed
High Flow							
500	496.9	500.7	498.4	498.7	3%	485 - 515	Passed
1000	1003.6	1007.8	1008.8	1006.7	3%	970 - 1030	Passed
2000	2004.0	1999.3	1993.8	1999.0	3%	1940 - 2060	Passed
2500	2504.7	2500.2	2503.2	2502.7	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By: นันทวัฒน์

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 05-Oct-25

Approved By: สุพจน์

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-071025-RYG_FS0122

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir PlusEquipment ID : RYG_FS0122
Serial No. : 20220731510
Calibration Date : 07-Oct-25
Next calibration date : 07-Jan-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-LEquipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

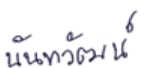
Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-MEquipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.2	19.6	19.6	19.5	5%	19 - 21	Passed
50	51.9	50.8	51.2	51.3	5%	48 - 53	Passed
100	100.3	101.4	101.4	101.0	5%	95 - 105	Passed
200	199.0	199.0	199.2	199.1	5%	190 - 210	Passed
High Flow							
500	503.7	504.3	504.3	504.1	3%	485 - 515	Passed
1000	1003.4	995.3	999.9	999.5	3%	970 - 1030	Passed
2000	2009.1	2022.0	2018.3	2016.5	3%	1940 - 2060	Passed
2500	2510.3	2506.3	2508.3	2508.3	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By: 

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 08-Oct-25

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Groups (Thailand) Co Ltd.
Organization Location: 104 Phattanakan 40 Phattanakan Rd Bangkok 10250

Date: May 9, 2025 3:29:14 PM
EQP Name: AgilentRecommended , AgilentRecommended

EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY Suchada T.
APPROVED BY Tanyatorn M.
NEXT CAL. DATE 9 May 26

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890
Front SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	24.8	psi
Accuracy:			0.2	psi
Agilent Recommended:			<= 1.2	

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)

<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)

<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.1167 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Amu: 1050 m/z

Drift After Five Minutes:

RFPA Voltage:

Agilent Recommended:

1 mV

497 mV

>= -100 and <= 100

<= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Date: May 9, 2025 3:29:14 PM
System ID: GM-12

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	<input type="text" value="7693A"/>			
Source:	<input type="text" value="EI - Extractor"/>			
Setpoint Status: <input type="text" value="Completed"/>				
Injection Volume on Column:	<input type="text" value="1.0"/> uL			
Overall Scouting Run Status				
<input type="text" value="Completed"/>				

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	<input type="text" value="7693A"/>			
Source:	<input type="text" value="EI - Extractor"/>			
Setpoint Status: <input type="text" value="Pass"/>				
Injection Volume on Column:	<input type="text" value="1.0"/> uL			
	Area		Retention Time	
Minimum RSD:	<input type="text" value="1.27"/> %		<input type="text" value="0.01"/> %	
Agilent Recommended:	<input type="text" value="<= 5.00"/>		<input type="text" value="<= 1.00"/>	
Status:	<input type="text" value="Pass"/>		<input type="text" value="Pass"/>	
Instrument Detection Limit:	<input type="text" value="4.28135"/> fg			
Agilent Recommended:	<input type="text" value="<= 16.82500"/>			
Status:	<input type="text" value="Pass"/>			
Overall Instrument Detection Limit Test Status				
<input type="text" value="Pass"/>				

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	<div>7693A</div>			
Source:	<div>El - Extractor</div>			
Setpoint Status:	<div>Pass</div>			
Injection Volume on Column:	<div>1.0</div>	uL		
	Area Mass 1		Mass Ratio	
	Abundance*s			
RSD:	<div>2.17</div>	%	<div>0.50</div>	%
Agilent Recommended:	<div><= 5.00</div>		<div><= 5.00</div>	
	<div>Pass</div>		<div>Pass</div>	

Overall Mass Ratio Precision Test Status

Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Instrument Details

Purpose

This section describes the as found system configuration.

Details

Tested Combination1	
Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10
Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.8.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077C
Serial Number	US2307MA35
Firmware Revision	6.00.35
Rough Pump	Wet Mechanical Vacuum Pump
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:	Phuwanai Yoktragul
Logged On User Name:	phuwanai.yoktragul@agilent.com
Signature Creation Date:	May 9, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:38:52 PM	Audit	SessionCreated	Session	Host Name: 5CG9217CJG, Drive Serial Number: BC4F1A47
May 8, 2025 2:38:52 PM	start	Configuration	Session	None
May 8, 2025 2:38:52 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 8, 2025 2:41:01 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurat ions/02.53/Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Proto col Revision :[Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Config urations/02.54/GcMs.02.54.e qp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 8, 2025 2:41:05 PM	End	Configuration	Session	None
May 8, 2025 2:41:09 PM	start	Qualification	Session	OQ
May 8, 2025 2:41:10 PM	start	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	None
May 8, 2025 2:42:42 PM	End	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	Run Count : 1

User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:43:00 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None
May 8, 2025 2:43:16 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:43:21 PM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:44:22 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:44:28 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:52:02 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:52:05 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:52:13 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 3:01:36 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:01:39 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 3:01:42 PM	start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 8, 2025 3:20:17 PM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 8, 2025 3:20:19 PM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 8, 2025 3:20:42 PM	start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 8, 2025 3:25:45 PM	End	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:25:48 PM	start	Execution	RFPD - 5977C SQ: - Source: EI - Extractor	None
May 8, 2025 3:36:10 PM	End	Execution	RFPD - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:36:50 PM	start	Execution	Tune EI - 5977C SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 8, 2025 3:43:21 PM	End	Execution	Tune EI - 5977C SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
May 8, 2025 3:43:27 PM	start	Execution	Tune EI - 5977C SQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:45:57 PM	End	Execution	Tune EI - 5977C SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 8, 2025 3:46:04 PM	Audit	AceClosed	Session	None
May 9, 2025 9:33:04 AM	Audit	AceRestarted	Session	Host Name: 5CG9217CJG, Drive Serial Number: BC4F1A47
May 9, 2025 9:33:06 AM	Audit	SessionReloaded	Session	None
May 9, 2025 9:33:59 AM	start	Qualification	Session	OQ
May 9, 2025 9:34:19 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:35:36 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 9:39:00 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:39:03 AM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 9:43:57 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None

User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:04:26 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 10:04:28 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 1:12:30 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:02:09 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 3:03:52 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\SC_OFN.D
May 9, 2025 3:04:25 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 150;Integration: Off at 0;Integration: On at 4]

User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:04:39 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:04:46 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.02; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:05:17 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Run Count : 1
May 9, 2025 3:05:21 PM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\IDL2.D

User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL3.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL4.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL5.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL6.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL7.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL8.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: C:\Users\yoktragul\Downloads - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : ALS_OQ2025\OQ2025\OQ2 025\IDL9.D

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User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217C.JG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\IDL10.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\IDL11.D
May 9, 2025 3:08:43 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 50;Integration: Off at 0;Integration: On at 4.6]
May 9, 2025 3:09:07 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 200;Integration: Off at 0;Integration: On at 4.6]
May 9, 2025 3:10:29 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1

User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OOQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:11:01 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	None
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP5.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP6.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP7.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP8.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP9.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\MRP10.D

User Name: phuwanai.yoktragul

System Id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:13:49 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 50000; Integration: Off at 0; Integration: On at 2]
May 9, 2025 3:15:04 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 9, 2025 3:16:15 PM	End	Qualification	Session	OQ
May 9, 2025 3:16:15 PM	start	Reporting	Session	None
May 9, 2025 3:26:19 PM	Audit	Reporting	Session	Report Generated : Certificate
May 9, 2025 3:27:20 PM	Audit	Reporting	Session	Report Generated : Report
May 9, 2025 3:28:25 PM	Audit	Reporting	Session	Report Generated : Report with Certificate



Certificate of Calibration

Certificate No. C-031025-RYG_FS0121

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0121
Serial No. : 20221211502
Calibration Date : 03-Oct-25
Next calibration date : 03-Jan-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

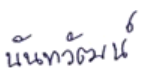
Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	19.7	19.8	19.8	5%	19 - 21	Passed
50	49.7	49.6	49.9	49.7	5%	48 - 53	Passed
100	102.6	104.2	103.2	103.3	5%	95 - 105	Passed
200	202.3	202.1	202.9	202.4	5%	190 - 210	Passed
High Flow							
500	501.1	503.4	505.0	503.2	3%	485 - 515	Passed
1000	1009.9	1005.6	1009.6	1008.4	3%	970 - 1030	Passed
2000	2003.5	2006.5	2002.6	2004.2	3%	1940 - 2060	Passed
2500	2508.3	2501.6	2511.6	2507.2	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By: 

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 04-Oct-25

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head

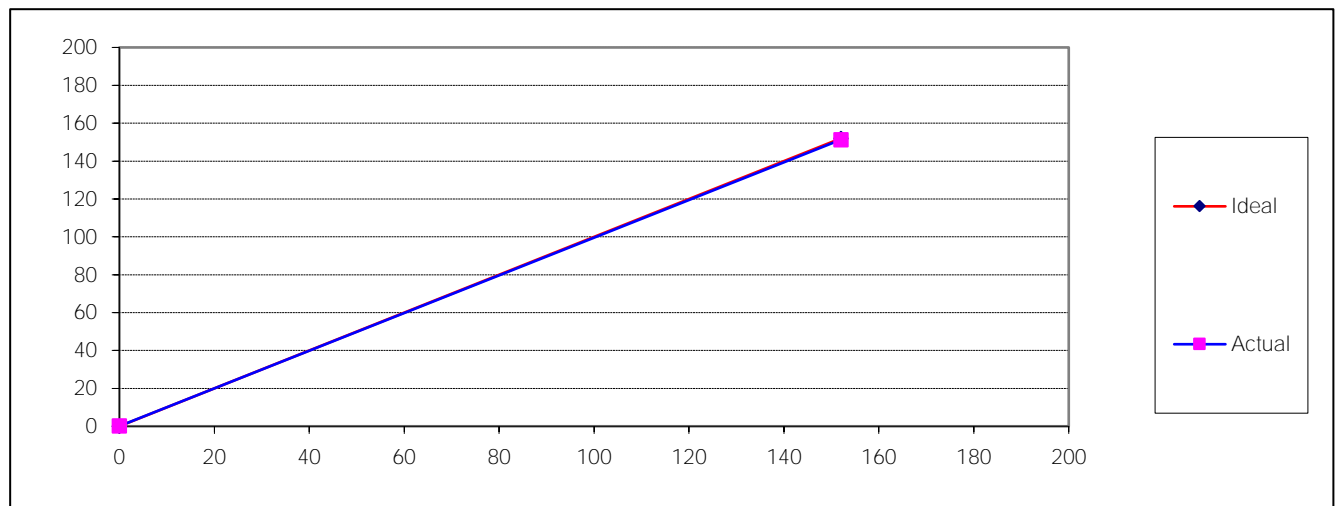


CALIBRATION REPORT

Calibration Date	1-Jul-25	Equipment ID	BKK_FS0758
Equipment Name	FID Analyzer	Manufacturer	Baseline Mocon
Model	9000H	Serial No.	0315EF0047
Std.Gas Conc.(ppm)	152	Cylinder No.	D878173
Certified Date	27-Jun-18	Expired Date	27-Jun-26

CALIBRATION RESULTS

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
SPAN	152.00	151.30	-0.70	-0.46
AVERAGE (%)				-0.18



Calibrated By

(Mr.Apisit Sing-ha)
Field Environmental Scientist (4)

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

Certificate of Calibration

Customer



Name : ALS Laboratory Group Thailand Co., Ltd. **Certificate No** : 25-ACT-010
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, **Request No** : Req-2025-0091
Bangkok 10250

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : RION Range : 94 dB / 1000 Hz
Model : NC-74 Instrument Status : Used
Serial Number : 34178121
ID : RYG_FS0213

Calibration Environment and Details

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


REVIEW BY 
APPROVED BY 
NEXT CAL DATE 16/01/26

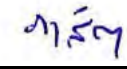
Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

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

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 16 January 2025

Certificate No : 25-ACT-010

Request No : Req-2025-0091

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.11	0.11	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	1.21	-	0.40	2.5	Pass

Note :

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

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

Certificate No : 25-ACT-010

Request No : Req-2025-0091

Decision Rule for Statements of Conformity

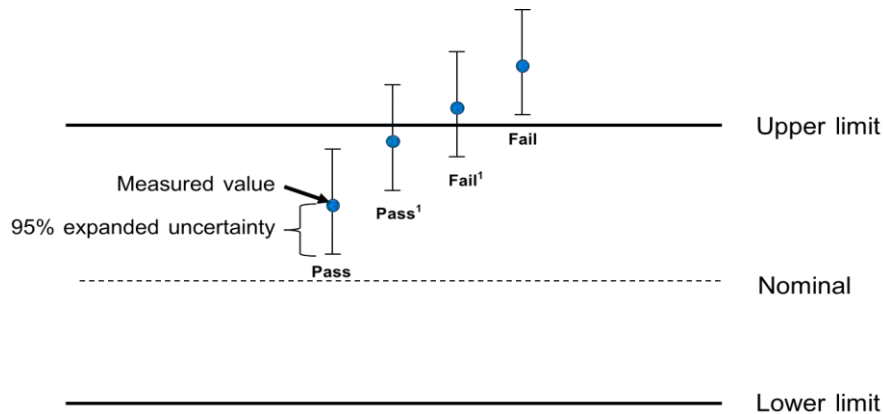
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Calibration



Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Certificate No : 25-SLM-114

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Request No : Req-2025-0603

Unit Under Calibration Details

Measurement item : Sound Level Meter

Microphone Class : 2

Manufacturer : RION

Microphone Model : UC-52

Model : NL-42

Microphone S/N : 143841

Serial Number : 01222723

Preamplifier Model : NH-24

ID : RYG_FS0022

Preamplifier S/N : 22770

Resolution : 0.1 dB

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C

Humidity : 50 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 6 March 2025

Calibrated Date : 19 March 2025

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration : Lab Acoustic

REVIEW BY *Manakorn P.*APPROVED BY *[Signature]*NEXT CAL DATE **19/03/26**

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	Brüel & Kjær	4192	2294985	25 June 2025	NIMT
Audio Generator	Svantek	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By : *[Signature]*
 Mr. Noppadon Luangart
 Service Calibration Engineer

Approved By : *[Signature]*
 Mr. Pacit Mathavorn
 Calibration Engineer Supervisor
 Issue Date : 19 March 2025



Certificate No : 25-SLM-114

Request No : Req-2025-0603

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz 94 dB	94.06	94.0	-0.06	94.1	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand RION, Model NC-75, SN.35002736

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	15.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	12.2	0.10
C	16.6	0.10
Z	20.4	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY	Acceptance Limit (± dB)	Result
FAST / 30-130	A	C	Z	(± dB)		
STD Setting	(dB)	(dB)	(dB)			
125 Hz	0.3	0.5	0.5	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.4	0.4	0.4	0.60	3.0	Pass
8000 Hz	-1.3	-1.3	-1.3	0.70	5.0	Pass

Certificate No : 25-SLM-114

Request No : Req-2025-0603

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance	Result
FAST / 30-130	Weighting Responce curve				Limit	
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	0.0	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	0.1	0.1	0.0		5.0	Pass
16000 Hz	-1.3	-1.3	0.0		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 30-130	REF	UUC	ERR			
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
30-130 / A	REF	UUC	ERR			
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass1
Slow	114.00	114.0	0.0		0.10	Pass1
Leq	114.00	114.0	0.0		0.10	Pass1



Certificate No : 25-SLM-114

Request No : Req-2025-0603

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)		(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)			
138.00	138	137.9	-0.1	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.0	0.0		1.1	Pass
34.00	34	34.0	0.0		1.1	Pass
29.00	29	29.1	0.1		1.1	Pass
24.00	24	24.0	0.0		1.1	Pass



Certificate No : 25-SLM-114

Request No : Req-2025-0603

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)		(± dB)	
30-130	29.50	29.7	0.2	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance	Result
A / 30-130	Toneburst	Ref	UUC	ERR		Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)	
Fast	200	126.0	126.1	+0.1	0.20	1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -5.0	Pass
SEL	200	120.0	120.0	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -2.5	Pass
	0.25	91.0	90.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
FAST / C / 55-141	REF	UUC	ERR		Limit	
STD Setting	(dB)	(dB)	(dB)		(± dB)	
Complete cycle	136.4	135.8	-0.60	0.20	3.0	Pass
Positive half cycle	135.4	135.2	-0.20		2.0	Pass
Negative half cycle	135.4	135.2	-0.20		2.0	Pass

Certificate No : 25-SLM-114

Request No : Req-2025-0603

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)		(± dB)	
Positive one-half cycle	139.5			
Negative one-half cycle	139.4			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)		(± dB)	
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013



Certificate No : 25-SLM-114

Request No : Req-2025-0603

Decision Rule for Statements of Conformity

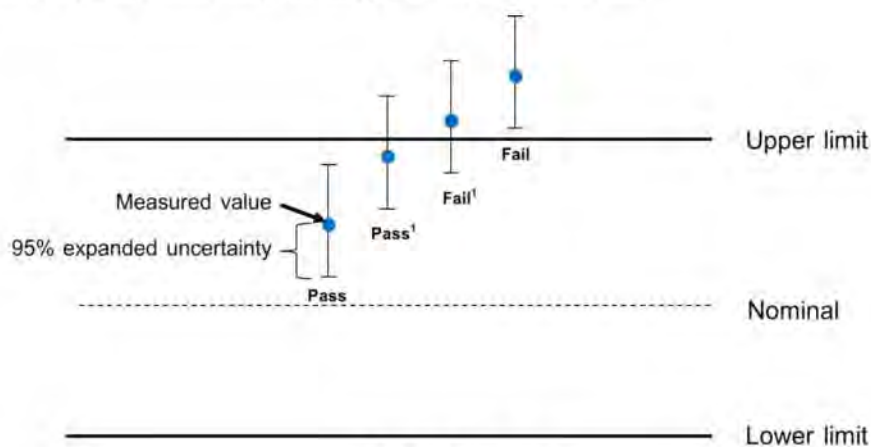
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

Cert. No. : ACL25074

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 157777 / 22653
ID No.: RYG_FS0024

Condition As Found : GOOD

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

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

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

REVIEW BY *Supt S.*

APPROVED BY *[Signature]*

NEXT CAL DATE..... 21/ 01/ 2026

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(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. : ACL25074
Job No. : VC68AC0059
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 :

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

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

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

3.1 National Institute of Metrology (Thailand).

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



Cert. No. : ACL25074
Job No. : VC68AC0059
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

S. Petch.

Cert. No. : ACL25074

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Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.2

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

Frequency Weighting	Weighting (dB)
A - weight	13.1
C - weight	19.2
Flat	24.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.7	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.0	0.0	0.0	±5.0

T. Ketch.

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	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
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

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

T. Petch.

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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	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	34.1	0.1	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

T. Petch.

Cert. No. : ACL25074
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8. Level linearity including the level range control

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

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

9. Tone burst response

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

T. K. K.

Cert. No. : ACL25074
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10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. R. S. S.

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd. **Certificate No** : 25-ACT-042
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, **Request No** : Req-2025-0604
Bangkok 10250

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : RION Range : 94 dB / 1000 Hz
Model : NC-75 Instrument Status : Used
Serial Number : 35002736
ID : RYG_FS0496

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 6 March 2025
Calibration Date : 19 March 2025
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

REVIEW BY 

APPROVED BY 

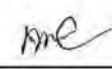
NEXT CAL DATE 19/03/26


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	4 February 2026

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

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 19 March 2025

Certificate No : 25-ACT-042

Request No : Req-2025-0604

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.06	0.06	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.98	-	0.40	2.5	Pass

Note :

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

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

Certificate No : 25-ACT-042

Request No : Req-2025-0604

Decision Rule for Statements of Conformity

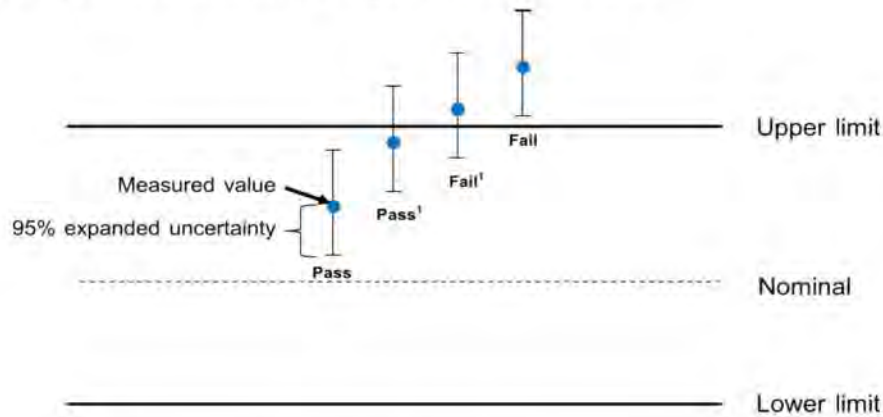
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Calibration

Cert. No. : ACL25072

Pages : 1 of 8

Calibration Certificate


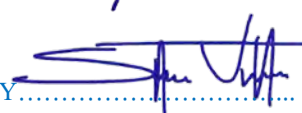
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122607 / 145554 / 34373
ID No.: RYG_FS0019

Condition As Found : GOOD

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

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

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

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	21/ 01/ 2026

Calibrated by :

Nathakorn Pisutpaisan

Approved by :


(Thanakul Petchurai)

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

Cert. No. : ACL25072

Job No. : VC68AC0059

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 :

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

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

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

3.1 National Institute of Metrology (Thailand).

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



Cert. No. : ACL25072
Job No. : VC68AC0059
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. : ACL25072

Job No. : VC68AC0059

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)
16.0

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

Frequency Weighting	Weighting (dB)
A - weight	12.6
C - weight	17.7
Flat	22.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.2	-1.2	-1.2	±5.0

S. Petcha.

Cert. No. : ACL25072
Job No. : VC68AC0059
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

T. Petch

Cert. No. : ACL25072

Job No. : VC68AC0059

Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.1	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	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

T. Petch.

Cert. No. : ACL25072
Job No. : VC68AC0059
Pages : 7 of 8

8. Level linearity including the level range control

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

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.1	0.1	1.5 ; -5.0
	200	800	127.6	127.7	0.1	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

T. Petch.

Cert. No. : ACL25072
Job No. : VC68AC0059
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (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	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

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

12. High level stability

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

S. Petcha-

Cert. No. : ACL25071

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122579 / 172172 / 74022
ID No.: RYG_FS0018

Condition As Found : GOOD

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

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

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

REVIEW BY *Supt. S.*

APPROVED BY *[Signature]*

NEXT CAL DATE..... 21/ 01/ 2026

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

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Cert. No. : ACL25071

Job No. : VC68AC0059

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 :

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

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

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

3.1 National Institute of Metrology (Thailand).

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



Cert. No. : ACL25071

Job No. : VC68AC0059

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. : ACL25071

Job No. : VC68AC0059

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Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.3
Flat	24.0

3. Acoustical signal tests of frequency weightings

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

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

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.1	0.1	± 1.1

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8. Level linearity including the level range control

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

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

9. Tone burst response

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

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10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. Petch.

Certificate of Calibration

Customer

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

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs Accuracy : 1% of Reading
Model : Defender 510-M Sensor Model : -
Serial Number : 151114 Sensor Serial Number : -
ID : BKK_FS0614 Instrument Status : Used
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator



Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

Calibration By : [Signature]
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : [Signature]
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

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

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

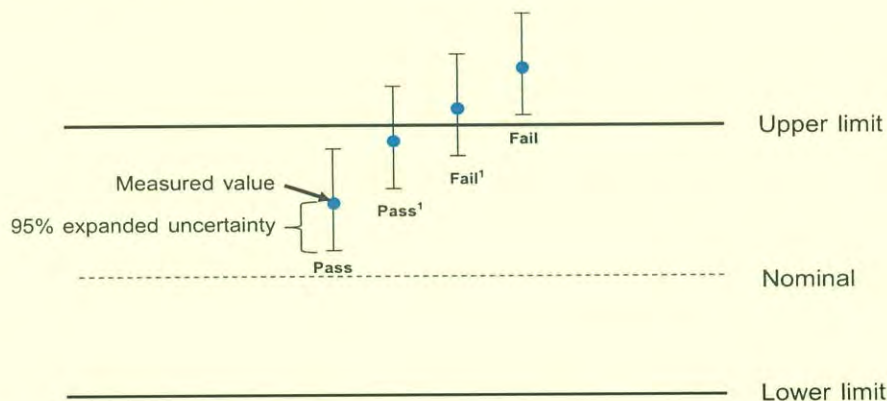
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate



บริษัท เอกเสคคิวทิฟ เทรดดิ้ง จำกัด (สำนักงานใหญ่)

48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230
TEL. (662) 515-0145-50 FAX. (662) 515-0144 www.etlthai.com E-mail : info@etlthai.com

ที่ RA 244/24

ใบรายงานผลการปรับเทียบ

ชื่อผู้ขอรับบริการ : บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด.
ที่อยู่ : 104 ซ.พัฒนาการ 40 ถ.พัฒนาการ แขวงสวนหลวง เขตสวนหลวง กรุงเทพมหานคร 10250.
ปรับเทียบที่ : บริษัท เอกเสคคิวทิฟ เทรดดิ้ง จำกัด
ที่อยู่ : 48/194-5 ซอย ประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวง/เขตลาดพร้าว กรุงเทพฯ 10230

รายละเอียดเครื่องมือที่ทำการปรับเทียบ :

เครื่องมือ : เครื่องตรวจวัดไอระเหยจากสารเคมี
ผลิตภัณฑ์ : RAE Systems
รุ่น : MiniRAE3000
หมายเลขเครื่อง : 592-906502
ID : BKK_FS0820

สภาวะแวดล้อม :

อุณหภูมิ : $(25 \pm 3) ^\circ\text{C}$
ความชื้นสัมพัทธ์ : $(35 \pm 15) \%$
ความดันบรรยากาศ : 760 มิลลิเมตรปรอท

วันที่ปรับเทียบมาตรฐาน : 9 กันยายน 2567

วิธีการปรับเทียบมาตรฐาน : ปรับเทียบโดยใช้ Standard Reference Gas
- Isobutylene Standard Gas 100 ppm; Cylinder No: WO349099-1.

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	9/3/26

ผลการปรับเทียบมาตรฐาน

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0.0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene)	87.2 ppm	100.0 ppm	0.0 ppm	Pass

Flow Rate of Pump : 478 cc/min.

Accuracy : $\pm 3 \%$ at calibration point

ผู้ปรับเทียบ :
(นายสุรินทร์ สายเนตร)
Service Engineer

ผู้ตรวจสอบ :
(นายสุทธิวงศ์ คงทองสังข์)
Service Engineer Manager

ผลการสอบเทียบ/ปรับเทียบ นี้ รับรองเฉพาะตัวอย่างและรายการที่ได้รับไปเท่านั้น

การนำรายงานผล/ใบรับรองนี้ไปโฆษณาและการคัดลอกหรือการนำผลบางส่วนไปเผยแพร่ต่อสาธารณะต้องได้รับอนุญาตเป็นลายลักษณ์อักษรจากทางบริษัทฯ



บริษัท เอกเสคคิวทิฟ เทรตติ้ง จำกัด (สำนักงานใหญ่)

48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230
TEL. (662) 515-0145-50 FAX. (662) 515-0144 www.etlthai.com E-mail : info@etlthai.com

No. RA 244/24

Certificate of Calibration

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang Bangkok 10250 TH.
Calibration location : Executive Trading Limited.
Address : 48/194-5 Soi Praditmanutham 19, Pradit Manutham Road, Latphrao, Bangkok 10230
Tools :
Instrument : Gas Detector
Product : RAE Systems
Model Name : MiniRAE3000
Serial Number : 592-906502
ID : BKK_FS0820
Environmental Condition:
Temperature : $(25 \pm 3) ^\circ\text{C}$
Relative Humidity : $(35 \pm 15) \%$
Pressure : 760 mmHg
Date of Calibration : September 9, 2024
Calibration Method : This instrument has been calibrated using calibration gases. Test and calibration data is On file with Executive trading limited.
Reference Standard : Isobutylene Standard Gas 100 ppm; Cylinder No:WO349099-1.

Test Result

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0.0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene)	87.2 ppm	100.0 ppm	0.0 ppm	Pass

Flow Rate of Pump : 478 cc/min.

Accuracy : $\pm 3 \%$ at calibration point

Calibrated By : 

(Mr. Surinthorn Sainate)

Service Engineer

Approved By : 

(Mr. Suttiwong Kongtongsang.)

Service Engineer Manager

The results relate only to the items tested or calibrated.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the company.



Calgaz Ltd
Unit 21/22, Rosevale Road
Parkhouse Industrial Estate West
Newcastle-under-Lyme
Staffordshire
ST5 7EF
United Kingdom
info@calgaz.com
Phone: +44 1782 566 897

Certificate Of Composition WO349099 - 1

Part Code: C003448
6DISOBUTYA-0100

Customer: Calgaz International LLc
Customer Order Number: PO21688/SO30280HON004SG

Cylinder No: WO349099-1
Cylinder Valve: C10
Gross Weight: 1.5
Nett Weight: 0.14

Component

Iso-Butylene
Air

Requested Values

100 ppm
Balance

Certified Values

100 ppm
Balance

Pressure: 1000 psi

Volume: 1.5 ltr

Size: 6D

Please note all units are in mol % and mixture accuracy +/- 2%
Relative Mixtures traceable to standards calibrated at the National
Physical Laboratory, Teddington, Middlesex, England The UK
National Physical Laboratory (NPL) Standards are internationally
recognised and directly equivalent to the USA N.I.S.T Standards.

Manufactured Date: 25/04/2022

Valid Until: 25/04/2027

UN 1856 Compressed gas, n.o.s.

(Oxygen, Nitrogen Mixture)

Certified By: Rhys Baldwin

All gases contained in this cylinder are non-breathing gases.
DO NOT INHALE

**CERTIFICATE
of
Attendance**

It is hereby certified that

Mr Surinthorn Sainate
(Executive Trading Limited)

has successfully completed the

RAE Service Training Course

Conducted by

HONEYWELL

on **2nd August 2022**



Conducted by : Desmond Tan
Service Engineer / Technical Trainer
Date of Issue : 2nd August 2022
Certificate valid for 2 years from date of issue

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 25BKL0006

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSE125P-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	33108993 RYG_EN0004	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY <i>Thanitak.</i>
APPROVED BY <i>D. Khunon.</i>
NEXT CAL DATE20/02/26.....

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	06 Mar 2025	Approval of the Calibration Certificate	Person in charge
		<input type="checkbox"/> <i>Chonchai</i>	<i>Kachen</i>
		Mr. Chonchai Inthana	Kachen Lalee

Calibration object

Multi interval instrument

Model	MSE125P-100-DU	
Serial Number	33108993	
QM Ident. no Inventory no.	RYG_EN0004 ---	
Range	1	2
Maximum capacity (Max. load)	60.00000 g	120.0000 g
Measured range	60.00000 g	120.0000 g
Scale interval	0.00001 g	0.0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. ---
Building Floor	--- 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	24.2 °C 0.3 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 62.5 %RH.

Measurement results | Measurement uncertainties

Repeatability			Eccentricity	
Test load (nominal): 50 g 100 g			Test load (nominal): 50 g	
	50 g	100 g		
1	50.00002 g	100.0000 g	Center	
2	50.00001 g	100.0000 g	Front left	
3	50.00003 g	100.0000 g	Back left	
4	50.00002 g	100.0000 g	Back right	
5	50.00001 g	100.0000 g	Front right	
6	50.00002 g	99.9999 g	Maximum deviation from centric loading indication	
7	50.00002 g	100.0000 g	Δ _{ecc} max = 0.00002 g	
8	50.00001 g	100.0000 g		
9	50.00001 g	100.0000 g		
10	50.00002 g	100.0000 g		
	<i>s</i> = 0.000007 g	<i>s</i> = 0.00003 g		

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
0.01000 g	0.01000 g	0.00000 g	2.00	0.000024 g	0.24 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
1.00000 g	1.00000 g	0.00000 g	2.00	0.000037 g	0.0037 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.0010 %
20.00002 g	20.00002 g	0.00000 g	2.00	0.000069 g	0.00034 %
55.00004 g	55.00003 g	-0.00001 g	2.00	0.00017 g	0.00031 %
70.0000 g	70.0000 g	0.0000 g	2.00	0.00017 g	0.00024 %
80.0001 g	80.0001 g	0.0000 g	2.00	0.00018 g	0.00023 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00017 g	0.00017 %
110.0000 g	110.0000 g	0.0000 g	2.00	0.00028 g	0.00025 %
120.0000 g	119.9999 g	-0.0001 g	2.00	0.00028 g	0.00023 %
Maximum error of indication		<i>E</i> _{max} = 0.00010 g			

*U*_{rel}(*E*) is the quotient of *U*(*E*) and test load *L*. The uncertainty of measurement *U*(*E*) is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement

Yes

Temperature deviation considered

1.5 K (isoCAL active)

Temperature coefficient considered

$1 \cdot 10^{-6}/\text{K}$

Uncertainty of the weighing result $U_{gl}(W)$

Partial weighing range 1 | 0.00000 g...60.00000 g

$U_{gl}(W) = 0.000016 \text{ g} + 6.61 \cdot 10^{-6} \cdot R$

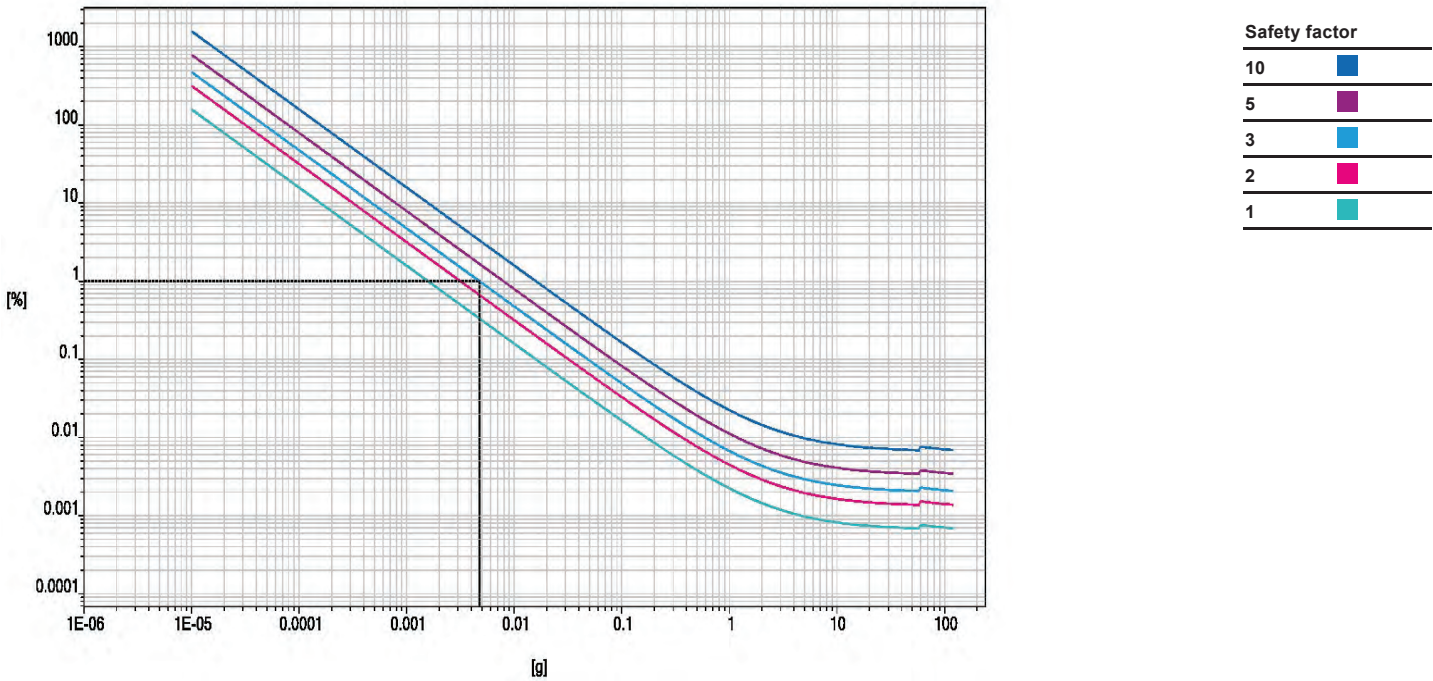
Partial weighing range 2 | 60.00000 g...120.0000 g

$U_{gl}(W) = 0.000086 \text{ g} + 6.19 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from Max1	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	0.60000 g	0.000020 g	0.0033 %
25 %	15.00000 g	0.00012 g	0.00077 %
50 %	30.00000 g	0.00021 g	0.00071 %
75 %	45.00000 g	0.00031 g	0.00070 %
100 %	60.00000 g	0.00041 g	0.00069 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy

1.00 %

Safety factor

3

Minimum sample weight

0.00474 g



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 25LM10

Page.: 1 of 2

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. Pluakdaeng,
Rayong 21140 Thailand

Location : TPA On Site Calibration Laboratory

Received Order : 17 January 2025

Calibrated Date : 20 January 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Approved Signatory

() Chakrit Waewwanjua

(✓) Suwit Imjai

() Kunchit Promprat

Issue Date : 23 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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

REVIEW BY Photchanas.

APPROVED BY

NEXT CAL DATE..... 20/07/26



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2501-0600DSC-2

Cert. No.: 25LM10
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	2188080	2411022	TPA	17 Sep 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 : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.002	19.81	-0.192	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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

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

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

Certificate of Testing

Cert.No.: 25TW15

Page.: 1 of 2

Equipment : DO Meter

Manufacturer : YSI

Model : 5000-115V

Serial No. : 15E102796

ID No. : RYG_EN0032

Received Date : 17 January 2025

Test Date : 20 January 2025


Reference : 2501-0600DSC-1

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
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 : Walalak Sirithean

Approved by : 
Approved Signatory

() Pornthippa Tameyakul
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 January 2025



Cert.No.: 25TW15

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).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study
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

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Certificate of Calibration

Cert. No.: 24TM1663

Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 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 : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee

Approved by :

Kunchit

Approved Signatory

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

Issue Date : 07 November 2024

REVIEW BY *Thanitak*

APPROVED BY *D. Khunon*

NEXT CAL DATE..... 01/05/26

The Uncertainties are for a confidence probability of approximately 95%

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



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

Cert. No.: 24TM1663

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
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.

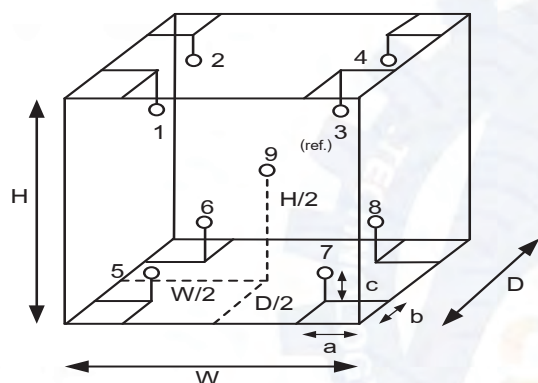
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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 :

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

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM1663

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

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

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

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

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

UUC* : Unit Under Calibration

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

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


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Certificate of Calibration

Cert.No.: 25CG3668

Page.: 1 of 2

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	RYG_EN0216
Manufacturer :	Witeg
Made in :	Germany
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5 T.MaenamKoo, A.Plukdaeng Rayong 21140, Thailand
Ambient Temperature :	(20 ± 2.5) °C
Relative Humidity :	(50 ± 10) %
Barometric Pressure :	753 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Srisuda Khamtha
Approved by :	 Approved Signatory
() Ponpan Paipim	
(✓) Chakrit Waewwanjua	

REVIEW BY *Thanitak*

APPROVED BY *D. Khamtha*

NEXT CAL DATE **18/09/26**

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Burette
Received Date : 16 September 2025
Condition As-Received : Used Item
Calibration Date : 18 September 2025
Reference : 2509-0564DSC-3

Cert.No.: 25CG3668

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	XP205	B134206712	140RC007	25MM296	TPA	16 July 2026
2) Humidity/Baro/Temp	MHB-382SD	AM.42259	140EC016	25H1616	TPA	14 Aug 2026
3) Digital Thermometer	HH376	230806555	140EC013	25I1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

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

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

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	10.0264	0.0082	2.00
25	25.0141	0.0087	2.00
50	49.9952	0.010	2.00

Remark mL = cm³

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

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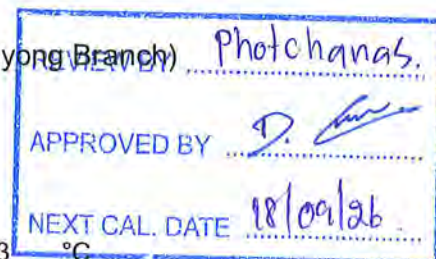


Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06250108
Issued Date: 18 March 2025
Job No.: WO-00064379
Page: 1 of 3

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



Environment Condition:

Temperature	24.4	°C	±	0.3	°C
Humidity	60.8	%RH	±	3.5	%RH

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


Calibration By: Mr.Preecha Phooarsai
Calibration Date: 18 March 2025
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 Starna Scientific Limited.

The standard for Wavelength Certificate No. 111583 and 111584

The standard for Photometric Certificate No. 9114984 and 111588

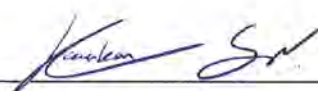
The standard for Stray light Certificate No. 111586 and 111585

The standard for Spectral resolution Certificate No. 111587



(Mr. Preecha Phooarsai)

Person in charge



(Miss Kaewkan Suradech)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

DKSH Technology Limited

2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

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

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.5	0.11	0.13
536.66	536.7	-0.04	0.13
637.98	638.3	-0.32	0.13
748.48	748.8	-0.32	0.13
807.03	807.5	-0.47	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.291	0.0020	0.0045
	0.5168	0.518	-0.0012	0.0045
	1.0298	1.031	-0.0012	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.285	0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0083	1.009	-0.0007	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.250	0.0016	0.0045
	0.4595	0.461	-0.0015	0.0045
	0.9334	0.935	-0.0016	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.246	0.0001	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.948	-0.0012	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.259	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.258	-0.0001	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.973	-0.0010	0.0045

Calibration Results:
Without Adjustment
Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7355	0.738	-0.0025	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.62 +/- 0.11 nm	260.6	1.7	1.770
391.44 +/- 0.11 nm	391.4	1.4	1.854

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.66	266.69	1.38	2.00
UUC: Wavelength (nm)	268.2	266.2		
Std Absorbance (A)	0.4566	0.2780		
UUC: Absorbance (A)	0.413	0.299		

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
18 Mar 2025			18 Mar 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	*
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	13.5 Hours
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	893.0 Hours
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ : * 656.1nm = 656.1nm

* 486.0nm = 485.7nm

Mr.Preecha Phooarsai

Service Engineer



Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. T242075

Page 1 of 3

Certificate of Calibration

Equipment : Liquid Bath (Water)

Manufacturer : Memmert

Model : WNE29

Serial No. : L623.0105

Customer Code : RYG_EN0220

ID No. : T5650A5

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

616/10 Moo 5 T.Maenam Khu,

A.Pluakdaeng, Rayong 21140

Customer Location : Wet Chemistry Lab

Date of Receipt : 11 December 2024

Calibrated By : Atiphong Rongrat (Technician)

Approved By : Boonchai / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 20 DEC 2024

REVIEW BY	<i>Thanitak.</i>
APPROVED BY.....	<i>D. Khunon.</i>
NEXT CAL DATE.....	19/12/25

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

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

Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 19 December 2024
Environment : Temperature : 25.3-25.9 °C
: Line Voltage : 221.4-225.4 V
: Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2001)).
All data show below were final values and the initial data from customer request . The temperature scale used, was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M34 (CH1-CH5)	T240400	16 March 2025
DATA LOGGER	34970A	T193	T240400	16 March 2025

3. This certificate is traceable to :

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

4. Condition of calibrated item : good


Equipment Description :

Time Const. 1 Hour 30 Minute At 63 °C

5. Adjustment :

(X) without adjustment

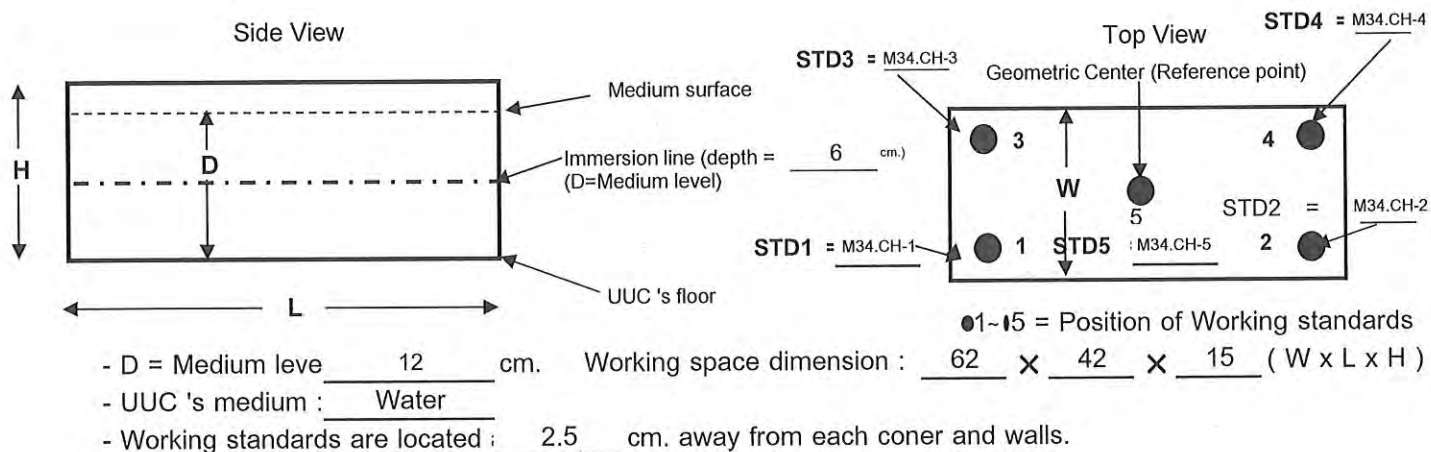
() after adjustment

Approved By. 

Certificate No. T242075

Page 3 of 3

Calibration Report



Measurement Results:

Average Standard Reading at each position (° C)					
Calibration Point	M34.CH-1	M34.CH-2	M34.CH-3	M34.CH-4	M34.CH-5
63	62.87	63.00	62.88	62.98	63.22
85	84.76	85.14	84.89	85.07	85.24

Liquid Bath (Water)			Temperature Distribution				
Setting (° C)	Reading (° C)		Average (° C)	Stability (± ° C)	Uniformity (± ° C)	Uncertainty (± ° C)	Coverage Factor k
	Min , Max	Average					
63.0	-	63.0	62.99	0.07	0.25	0.23	2.00
85.0	-	85.0	85.02	0.13	0.35	0.26	2.00

The calibration result apply only the above calibrated item.

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

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

Approved By. 



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 25CH847

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenCompact S220
Serial No. : C104059460
ID No. : RYG_EN0183
Condition As-Received: Used Item
Received Date : 17 July 2025
Calibration Date : 18 July 2025
Reference : 2507-0561DSC-3
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :

Saithip

Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 25CH847

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	3240076	60RC033	25I394	01 Apr 2026

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

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1114385	08 June 2026

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: C104059460	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.2	7.000	0.058	2.00
	10.000	-177.48	-177.6	10.000	0.058	2.00



Cert.No.: 25CH847

Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 5240606	4.007	4.008	184.6	0.0044	2.00
	6.965	6.966	10.2	0.0084	2.00
	10.010	10.009	-164.9	0.0065	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM

- Serial No. : 5240606

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

-o0o-



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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 25E2372

Page : 1 of 2

Equipment : pH Meter
Manufacturer: Mettler Toledo
Model : SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183
Condition As-Received: Used Item
Received Date: 17 July 2025
Calibration Date: 22 July 2025
Reference: 2507-0561DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch

616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 according to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Multi-Product Calibrator	5500A	6315011	25E1627	19 May 2026

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

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

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

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

Calibrated by : Napachanok Prasomsoosiri
Issue Date : 23 July 2025

Approved Signatory : _____

[] Phalinee Prabpaipal

[] Nuntawat Khamchai

[✓] Pongsagorn Boonyaporn



Cert. No.: 25E2372

Page.: 2 of 2

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

Function: DC voltage measurement

Range:

2000

mV

<u>Standard Value</u>	<u>UUC* Reading</u>	<u>Error</u>	<u>Uncertainty</u>
(mV)	(mV)	(mV)	($\pm \mu V$)
-200.0000	-200.0	0.0	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	49.9	-0.1	61
100.0000	99.9	-0.1	63
150.0000	149.9	-0.1	65
200.0000	199.9	-0.1	68

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.

-o0o-

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 25BKL0002

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MCE224S-2S00-U	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	38101399 RYG_EN0163	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY *Thanitak.*APPROVED BY *D. Khunon.*NEXT CAL DATE *20/02/26*

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	06 Mar 2025	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Kachen Lalee

Calibration object

Single range instrument

Model	MCE224S-2S00-U
Serial Number	38101399
QM Ident. no Inventory no.	RYG_EN0163 ---

Maximum capacity (Max. load)	220.0000 g
Measured range	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. ---
Building Floor	--- 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	24.4 °C 0.6 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 58.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	200.0000 g
3	10.0000 g	200.0001 g
4	9.9999 g	200.0000 g
5	9.9999 g	200.0000 g
6	10.0000 g	200.0001 g
7	10.0000 g	200.0000 g
8	10.0000 g	200.0000 g
9	9.9999 g	200.0001 g
10	10.0000 g	200.0000 g
	<i>s</i> = 0.00005 g	<i>s</i> = 0.00005 g

Eccentricity

Test load (nominal): 100 g	
Center	100.0000 g
Front left	100.0000 g
Back left	100.0000 g
Back right	100.0000 g
Front right	99.9999 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
0.0100 g	0.0100 g	0.0000 g	2.00	0.00013 g	1.3 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	9.9999 g	-0.0001 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0001 g	0.0001 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$ E _{max} = 0.0001\text{ g}$			

*U*_{rel}(*E*) is the quotient of *U*(*E*) and test load *L*. The uncertainty of measurement *U*(*E*) is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-6}/\text{K}$

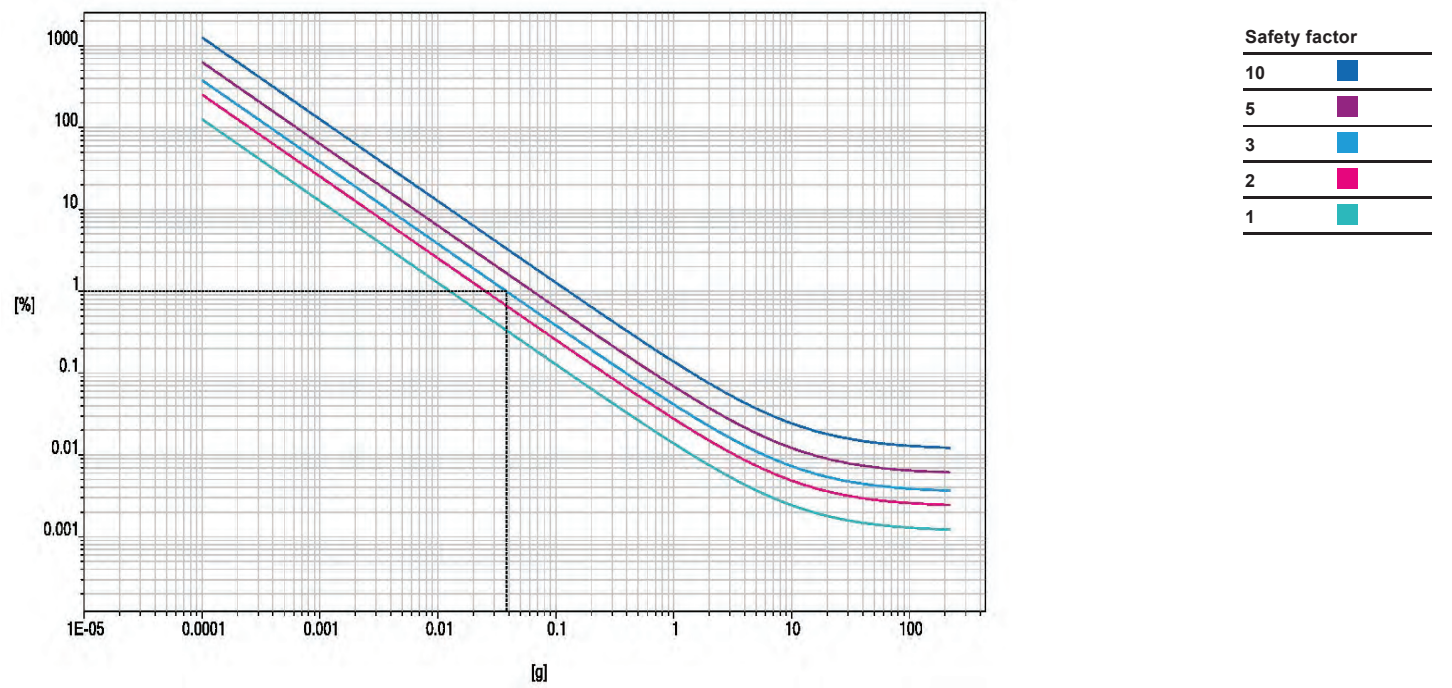
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 1.16 \cdot 10^{-5} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00016 g	0.0071 %
25 %	55.0000 g	0.00077 g	0.0014 %
50 %	110.0000 g	0.0014 g	0.0013 %
75 %	165.0000 g	0.0020 g	0.0012 %
100 %	220.0000 g	0.0027 g	0.0012 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0381 g

Certificate No. T251530

Page 1 of 3

Certificate of Calibration**Equipment** : Chamber (Oven)**Manufacturer** : MEMMERT**Model** : UF 110**Serial No.** : B416.2420**Customer Code** : RYG_EN0012**ID No.** : T6444A5**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)

616/10 Moo 5 T.Maenamkoo,

A.Pluakdaeng, Rayong 21140

Customer Location : ENVIRONMENT LABORATORY**Date of Receipt** : 3 September 2025**Calibrated By** : Sujjar Naknakred (Site Calibration Manager)**Approved By** :  Boonchai Suriyawong (Site Calibration Manager)**Date of Issue** : 17 SEP 2025**The uncertainties are for a confidence probability of approximately 95%.**

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

Certificate No. T251530

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 10 September 2025
Environment : Temperature : 35.7-36.6 °C
Line Voltage : 226.8-233.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986).

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	30-(CH1-10)	T242203	9 November 2025
DATA LOGGER	34970A	T47	T242203	9 November 2025

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 3 Hour 29 Minute At 104 °C

Fresh Air Damper ☒ Open ☒ Min ☐ Medium ☐ Max

☐ Close

☐ Not Available

5. Adjustment :

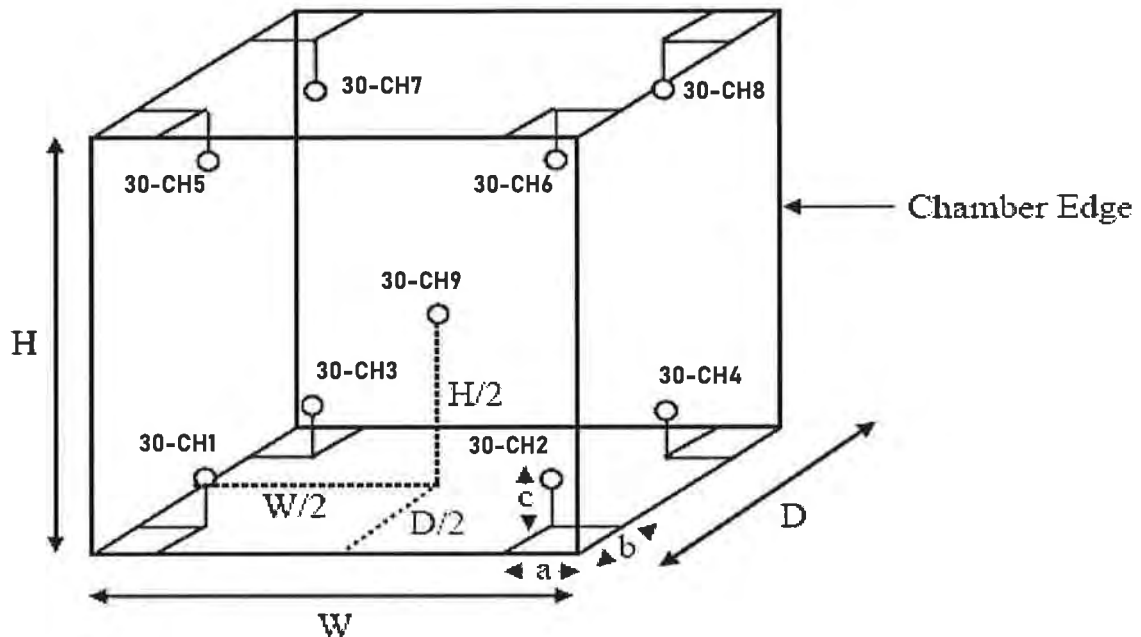
() without adjustment

(X) after adjustment

Approved By. _____



Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 48 cm. and D (Depth) = 40 cm.
Size of Installed Standard sensor number 30-CH1 to number 30-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.
Size of Installed Standard sensor number 30-CH9 : W/2 = 56 cm./2 , H/2 = 48 cm./2 and D/2 = 40cm./2

Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	30-CH1	30-CH2	30-CH3	30-CH4	30-CH5	30-CH6	30-CH7	30-CH8	30-CH9
104	104.02	103.70	104.01	104.16	104.11	104.08	104.01	104.33	103.61
180	180.67	178.78	180.38	179.85	179.16	180.27	180.98	181.04	179.49

Chamber (Oven)			Temperature Distribution				
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
104.0	103.9 , 104.1	104.0	104.00	0.08	0.61	0.42	2.00
180.0	179.9 , 180.1	180.0	180.07	0.21	1.51	0.52	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

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

End of Certificate.

Approved By. _____





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Certificate of Calibration

Cert.No.: 25CH458

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C221115514
ID No. : RYG_FS0596
Condition As-Received: Used Item
Received Date : 24 June 2025
Calibration Date : 25 June 2025
Reference : 2506-0782DSC-4
Submitted by :

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

Calibrated by : Walalak Sirithean

Approved by :

Saithip

Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 26 June 2025

REVIEW BY *Pitthaya T.*
APPROVED BY *Saithip S.*
NEXT CAL DATE 25/06/26

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 25CH458

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1114385	08 June 2026

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: C221115514	4.00	177.48	178	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00



Cert.No.: 25CH458

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Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 3293232	4.007	4.01	163	0.0079	2.00
	6.965	6.99	-10	0.011	2.00
	10.010	10.00	-185	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Go-ISM

- Serial No. : 3293232

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.002	25.1	0.098	0.13	2.00
45.0	45.001	45.2	0.199	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน

ที่อก ๐๓๑๐(๑)/ ๑๖๑๖๘



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๐ พฤศจิกายน ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๔ สิงหาคม ๒๕๖๖

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ ๑๘๑ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสิระ จันทรเจ็ด)

นักวิทยาศาสตร์เชี่ยวชาญ วิชาการราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๔๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ ออก ๐๓๑๐(๑)/ ๑ ๖ ๑ ๖ ๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นางสาวยุพาพร จันทรเปล่ง | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๑ |
| ๒) นางสาวชัชชัย โกมารกุล ณ นคร | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๒ |
| ๓) นายศรายุทธ จิตรานนท์ | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๓ |
| ๔) นางสาวนกกร เอนก | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๔ |
| ๕) นายสุริยา สอนแก้ว | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๕ |
| ๖) นายวิชาญ ชุณหะวัณ | ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๖ |

วิมล

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ ออก ๐๓๑๐(๑)/ ๑๖๑๖๘

ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๘๑ ราย

๑) นายกาจบัณฑิต กิตติคุณวิชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๑
๒) นายภัทรพล สว่างใจธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๒
๓) นายนราธิป เทือกชัยคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๓
๔) นายศิริโชค พงษ์ประสม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๔
๕) นายณัฐวุฒิ ดั่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๕
๖) นางสาวจินดา ไชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๖
๗) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๗
๘) นางสาวชนัญญาญจน์ อัมมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๘
๙) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๙
๑๐) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๐
๑๑) นางสาวศรณิยา เฉลิมธารงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๑
๑๒) นางสาวธัญญธร มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๒
๑๓) นางสาวศิริลักษณ์ บุญนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๓
๑๔) นายพนพงค์ จันทุพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๔
๑๕) นายนรเศรษฐ์ โกมลาลัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๕
๑๖) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๖
๑๗) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๗
๑๘) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๘
๑๙) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๙
๒๐) นางสาวเปมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๐
๒๑) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๑
๒๒) นางสาวเสาวลักษณ์ ภูณภาพพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๒
๒๓) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๓
๒๔) นายศักดิ์สิทธิ์ ไพศาลพิสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๔
๒๕) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๕
๒๖) นางจิตตา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๖
๒๗) นางสาวอรรพรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๗
๒๘) นางสาวนพรัตน์ แยมกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๘
๒๙) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๙
๓๐) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๐
๓๑) นายพรมมี ศรีปัดเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๑
๓๒) นายอุทิศ อุ่นสีม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๒
๓๓) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๓
๓๔) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๔
๓๕) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๕



๓๖) นางสาวจุฑารัตน์...

๓๖) นางสาวจุฑารัตน์ โอนสันเทียะ
๓๗) นางสาวจารุวรรณ พิมพ์อภิฤติยา
๓๘) นางสาวปรารค์ทิพย์ กิจไพศาลศักดิ์
๓๙) นางสาวเดือนใจ ทางกลาง
๔๐) นางสาวจิราพร ศิริเวช
๔๑) นายวรากร ผูกרךซ์
๔๒) นายทง วิริยะสทกิจ
๔๓) นายธนิศ เจนจบ
๔๔) นายคณิศร ขำเพชร
๔๕) นายภูวิช พรหมสะอาด
๔๖) นายธนเดช โกศาพิพัฒน์
๔๗) นายชวฤทธิ์ วงษ์จันทร์
๔๘) นายอาทิตย์ ศรีเสน
๔๙) นายเจษดินทร์ คงศักดิ์ไทย
๕๐) นายจรัส บุญยั้ง
๕๑) นายธนาณัติ เอนก
๕๒) นายอภิวัฒน์ ทุมหนู
๕๓) นางสาวสุภาขวัญ มาก
๕๔) นางสาวหัตถพร ขวาลสมบุรณ์
๕๕) นางสาวธิตีมา บุญเพ็ง
๕๖) นางสาวภานุมาศ นามวัฒน์
๕๗) นางสาวอุไรรัตน์ ทังสร้างแป้น
๕๘) นายธีรวัฒน์ ปวงสุข
๕๙) นายอิทธิพล ยะโส
๖๐) นายประพจน์ วรรณชูชัย
๖๑) นายชยธร พวงทิพย์
๖๒) นางสาวกนกวรรณ จันทบาล
๖๓) นายสิทธิโชค ธงเงิน
๖๔) นางศิวาวรรณ ใจบุญ
๖๕) นางสาวพรรณธิดา พุ่มคง
๖๖) นายนวกัทร ศรีวิริยะ
๖๗) นายสุวิชา ทองอ่อน
๖๘) นายวิญญู บุญตะนัย
๖๙) นายสมบุรณ์ บุตรจันทร์
๗๐) นายวิรัตน์ ไชยนระรา
๗๑) นายณฤเบศน์ เพิ่มพูน
๗๒) นายจิรณัฐ ขาวละออ
๗๓) นายอัสนี นามบุรี
๗๔) นายอัศวเรศ จ่อสา

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๖
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๗
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๘
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๙
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๐
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๑
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๒
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๓
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๔
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๕
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๖
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๗
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๘
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๙
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๐
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๑
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๓
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๘
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๓
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๔

3กมล

๗๕) นายประเสริฐ สุระขันธุ์
๗๖) นายอนุกุล จันทน์เนียม
๗๗) นายพิรพงษ์ ทองคุณปรีดา
๗๘) นายณฤพล ทองนุช
๗๙) นายอนุวัฒน์ ม่วงแพ
๘๐) นายเจตศราวุฒิ ปัตตะมะ
๘๑) นายกฤษณะ สายวรรณ
๘๒) นายพิชัย บุญยงค์
๘๓) นายภาณุพงศ์ โสมวงศ์
๘๔) นายสามารถ คุ่มปลี
๘๕) นายสัญญาชัย โกศรีนาม
๘๖) นายณัฐวุฒิ ศรีประเสริฐ
๘๗) นายชวัลธัช นาคพนม
๘๘) นายพงศธร ชัยทิพย์
๘๙) นายสิทธิโชค ทาสีดา
๙๐) นายธนากร อินสุตา
๙๑) นางสาววรรณิษา ชาตวันชัย
๙๒) นางสาวพิมพ์ตะวัน มินากุล
๙๓) นางสาวเพชรรัตน์ สิงห์สมบุญ
๙๔) นางสาวชญานิน พรหมจันทร์
๙๕) นายกীরติ ทวีราช
๙๖) นายจักริน หมั่นวิชา
๙๗) นายฉัตรชัย สุขเปี้ย
๙๘) นายณรรนท ต๊ะทองคำ
๙๙) นายดุสิตพล สนนอก
๑๐๐) นายทักษ์ดนัย อุบลศรี
๑๐๑) นายธนากร นามะกฤษณา
๑๐๒) นายธิตพงศ์ บัวแดง
๑๐๓) นายนนทชัย อุปถัมภ์
๑๐๔) นายณัฐพล คุณสุทธิ
๑๐๕) นายณัฏฐวัฒน์ สาริน
๑๐๖) นายปิยะนัฐ พลมะศรี
๑๐๗) นายพงศ์สิริ โสมเขียว
๑๐๘) นายพีรพัฒน์ กำคำ
๑๐๙) นายภาณุพงศ์ มานิตย์
๑๑๐) นายมงคล ผลาทิพย์
๑๑๑) นายสิรินันท์ ทองอ้น
๑๑๒) นายอเนชา ทันสมัย
๑๑๓) นายอดิศักดิ์ ผมไผ

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๕
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๓

วิมล

๑๑๔) นายอนันตชัย...

๑๑๔) นายอนันตชัย วิสม
๑๑๕) นายวรวิธ ตีนัก
๑๑๖) นายแสงตะวัน นตะสัด
๑๑๗) นายยุทธพงศ์ รัตนะ
๑๑๘) นายชัยวัฒน์ ไชยชนะนิจ
๑๑๙) นายวิศรุต ศรีธรรมมา
๑๒๐) นายณนทกร เผือกผ่อง
๑๒๑) นายกำชัย สุทธะ
๑๒๒) นางสาวณัฐภรณ์ บุญตะนัย
๑๒๓) นางสาวพัชรินทร์ แสนสร้อย
๑๒๔) นายไพรวลัย เปี่ยมพิมาย
๑๒๕) นางสาวศุภมาศ ทองมาก
๑๒๖) นางสาวลลิตา จิตรสว่าง
๑๒๗) นางสาวไมพร เสิกภูเขียว
๑๒๘) นางสาวกฤติมาพร คำมีแก่น
๑๒๙) นางสาวสกุลรัตน์ ภาคภูมิ
๑๓๐) นางสาวไพรินทร์ ศรีรูปี
๑๓๑) นางสาวทิพนเตร ผุยปัญญา
๑๓๒) นางสาวสาธิตา ปานทอง
๑๓๓) นางสาวอริสา ทองนวล
๑๓๔) นางสาวอรรยา คำคล้อง
๑๓๕) นางสาวชุตาภรณ์ สุนทรสนาน
๑๓๖) นางสาวอัญชลี คำจันทร์
๑๓๗) นายบุญฤทธิ์ เอี่ยมเทศ
๑๓๘) นางสาวศุภรดา บันมยุรา
๑๓๙) นางสาวพาฤดี คุณนาน
๑๔๐) นางสาวจิราเจต ฟองดา
๑๔๑) นางสาวอารยา มีชัย
๑๔๒) นางสาววิษุตา นาคผจญ
๑๔๓) นางสาวนันทิยา จันทะสุน
๑๔๔) นายกิตติพงศ์ แซ่ลี
๑๔๕) นายอนวัติ ภูถวิล
๑๔๖) นายธีรพล แสงทอง
๑๔๗) นายศักดิ์พิพัฒน์ บุญมัน
๑๔๘) นายฐิติวัลด์ เอมอุไร
๑๔๙) นายชัยณรงค์ ศรีบุรินทร์
๑๕๐) นางสาวอัจฉราวรรณ สอนสนอง
๑๕๑) นางสาวณัฐพร สิงหา
๑๕๒) นายกัมเรศ แหยมโต

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๔
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๕
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๖
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๘
ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๙
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๒

31/๑๖

๑๕๓) นางสาวอุบล เคิกศิริ
๑๕๔) นางสาวมโนรัตน์ ทองบุตร
๑๕๕) นายภาคภูมิ แทนไทย
๑๕๖) นางสาวสุภาณัฐ เมล์พวง
๑๕๗) นางสาวพรทิศา สาดาชนม์
๑๕๘) นายเอกวิทย์ วันทะนา
๑๕๙) นายไตรมณฑล ทิพย์วรรณ
๑๖๐) นายจิรเมธ ประเสริฐสิริพงศ์
๑๖๑) นายจิรายุส เกษมสุข
๑๖๒) นายจิรศักดิ์ ศรีวิชัย
๑๖๓) นายณัฐกฤษณ์ สะพานแก้ว
๑๖๔) นายบุรณศักดิ์ ปะที
๑๖๕) นายปณณวิทย์ เสมอทรัพย์
๑๖๖) นายพิษณุพงษ์ ไชยา
๑๖๗) นายภัทรพงษ์ มณฑาทอง
๑๖๘) นายวสันต์ ตรีนกุล
๑๖๙) นายภาณุเดช เพชรอุด
๑๗๐) นายอนุกุล วิละแสง
๑๗๑) นายภัทรพงษ์ มีสุข
๑๗๒) นางสาวนุชรวี ลีละทีป
๑๗๓) นางสาวสุภาวดี โกศรีนาม
๑๗๔) นางสาวอรณิข เทียนคำ
๑๗๕) นางสาวพรเพ็ญ ชอบสอน
๑๗๖) นางสาววันวิสา ขอนพิกุล
๑๗๗) นางสาวอรรณณ เถาว์ทอง
๑๗๘) นางสาวอัยย์ลีน เมอร์วิณณ์
๑๗๙) นางสาววิสรา ค่อยครอง
๑๘๐) นายวุฒิกร ศิริวรรณ
๑๘๑) นางสาวจรรวรรณ กระจำงพันธุ์

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๓
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ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๑

วิมล

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๖๑๖๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๗๔ รายการ

น้ำเสีย จำนวน 60 รายการ

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

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 ^[4] 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]

Small

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 ^[4]
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]

วิมล

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]

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]

ลำดับที่	สารมลพิษ	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]

3m

ลำดับที่	สารมลพิษ	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]

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ลำดับที่	สารมลพิษ	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]

ลำดับที่	สารมลพิษ	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 ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,25]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C ₈ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,22]
111	TPH (C ₁₆ -C ₃₅)	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]

อากาศเสีย (ปล่อยระบาย) จำนวน 28 รายการ

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

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Manganese	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
17	Mercury	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
18	Nickel	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
19	Opacity	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
20	Oxides of Nitrogen	2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[5]
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
22	Sulfur Dioxide	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
23	Sulfuric Acid	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[5]
24	Tellurium	2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method ^[5]
25	Tin	3) Instrumental Analyzer Method ^[5]
26	Total Suspended Particulate	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
		2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
		1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5]
		2) Instrumental Analyzer Method ^[5]
		Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
		1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
		2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
		1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
		2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
		1) Isokinetic Sampling, Gravimetric Method ^[5]
		2) Paired Train, Isokinetic Sampling, Gravimetric Method ^[5]

3mml

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[5]
28	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว 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 ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
2	Antimony	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]
3	Arsenic	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]
4	Barium	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]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	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]
6	Cadmium	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]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,17] 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 ^[1,6,16,19] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,6,17,19] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,16,19] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,17,19]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^[1,6,19] 2) Alkaline Digestion, Colorimetric Method ^[8,19]
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 ^[7,16] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,17]
12	Copper	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]
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 ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
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 ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
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 ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,26]

amal

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] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,26] 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 ^[10,26] 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 ^[10,26] 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 ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,26]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,6,20] 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 ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^[11,26]
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method ^[11,26]
25	Molybdenum	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]
26	Nickel	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]
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 ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[11,26]

3m

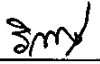
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 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	
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,26]
29	pH	Electrometric Method ^[23,24]
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]

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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 ^[1,9,26] 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]

31/10/2564

ดิน 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]
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] 

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,26]
12	Benzo(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]

สม

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[7,16] 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 ^[15,25]
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[7,16] 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]

สมย

ลำดับที่	สารมลพิษ	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 ^[15,25]
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]

Smel

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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]

3/1/20

ลำดับที่	สารมลพิษ	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 ^[15,25]
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 ^[15,25]
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[13]

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 ^[30]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[13,25]
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 ^[15,25]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]
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]

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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',3,4,4',5',6-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]

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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 ^[15,25]
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]
109	TPH (C ₈ - C ₁₆)	1) Automate Extraction, Gas Chromatographic Method ^[11,22] 2) Solvent Extraction, Gas Chromatographic Method ^[12,22] 3) Ultrasonic Extraction, Gas Chromatographic Method ^[22,31]
110	TPH (C ₁₆ - C ₃₅)	1) Automate Extraction, Gas Chromatographic Method ^[11,22] 2) Solvent Extraction, Gas Chromatographic Method ^[12,22] 3) Ultrasonic Extraction, Gas Chromatographic Method ^[22,31]
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,26]
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,26]
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
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 ^[15,25]
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[15,25]
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,17]

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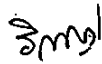
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ที่ อก ๐๓๑๐(๑)/ ๔๑๒๑

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๕ เมษายน ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๙ มีนาคม ๒๕๖๗

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

- | | |
|--------------------------|----------------------------|
| ๑) นางสาวพรรณธิดา พุ่มคง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๕ |
| ๒) นายกำชัย สุทธะ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๑ |
| ๓) นางสาวศุภรดา บัณมยุรา | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๘ |

๒. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

- | | |
|-----------------------------|----------------------------|
| ๑) นางสาวฐานิดา กลิ่นเขียว | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๒ |
| ๒) นางสาวกัญญภััสสร สายคำ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๓ |
| ๓) นางสาวณัฐนันท์ กันทะวงศ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๔ |
| ๔) นายอำนาจ วงษาเคน | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๕ |
| ๕) นายกฤษณพล ปัญญาวงศ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๖ |
| ๖) นายณชากร หารรักษา | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๗ |
| ๗) นายวัชรินทร์ ผ่องสามสวน | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๘ |
| ๘) นายณัฐพงศ์ โสภา | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๙ |
| ๙) นายศักรินทร์ ปานเพ็ง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๐ |
| ๑๐) นายณัฐพล ชุ่มชื่น | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๑ |
| ๑๑) นายธนา สุพาพันธุ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๒ |
| ๑๒) นายนราธร แก้วพงษ์ชา | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๓ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๒ กันยายน ๒๕๖๙

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพริต ก้านกรอง)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ที่อก ๐๓๑๐(๑)/ ๑๒ ๓๖ ๘ /



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๘ ธันวาคม ๒๕๖๗

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒ ธันวาคม ๒๕๖๗

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๘ ราย ได้แก่

- | | |
|-------------------------------|----------------------------|
| ๑) นายประพจน์ วรรณชูชัย | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๐ |
| ๒) นายจิรณัฐ ขาวละออ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๒ |
| ๓) นายพีรพัฒน์ กำคำ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๘ |
| ๔) นางสาวอรยา คำคล่อง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๔ |
| ๕) นายกิตติพงศ์ แซ่ลี | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๔ |
| ๖) นายจิรเมธ ประเสริฐศิริพงศ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๐ |
| ๗) นายภัทรพงษ์ มณฑาทอง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๗ |
| ๘) นางสาวจารุวรรณ กระจำงพันธ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๑ |

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๑๐(๑)/ ๓ ๑ ๕ ๐



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๐ เมษายน ๒๕๖๘

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒ เมษายน ๒๕๖๘

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์
จำนวน ๒ ราย ได้แก่

๑) นายธิตพิงค์ บัวแดง

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๒

๒) นายมงคล ผลาทิพย์

ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๐

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ที่ อก ๐๓๑๐(๑)/ ๕ ๖ ๗ ๓



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๕ มิถุนายน ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๗ พฤษภาคม ๒๕๖๔

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน
จำนวน ๑๑ ราย ได้แก่

- | | |
|-----------------------------------|----------------------------|
| ๑) นายคุณากร มั่นชื่น | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๔ |
| ๒) นายชัยมงคล แสนมาตร | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๕ |
| ๓) นายเอกรินทร์ บุตส์ักดิ์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๖ |
| ๔) นายพิชานนท์ อินปริง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๗ |
| ๕) นายศตวรรษ แก้วกันหา | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๘ |
| ๖) นายวิกรม มีศิริ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๙ |
| ๗) นายภคนันท์ คำจันทราช | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๒๐๐ |
| ๘) นายศิริวิทย์ มีไพฑูรย์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๒๐๑ |
| ๙) นายธีรพงษ์ ศรีคำแหง | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๒๐๒ |
| ๑๐) นายอภิสิทธิ์ ศรีคงแก้ว | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๒๐๓ |
| ๑๑) ว่าที่ร้อยตรี ภาณุพงศ์ แสนศรี | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๒๐๔ |

อนึ่ง หนังสือฉบับนี้จะสิ้นอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันท์เลิศ)

นักวิทยาศาสตร์เชี่ยวชาญ รัชการยการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๑๐(๑)/ ๒๕๐๘



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๑ สิงหาคม ๒๕๖๔

เรื่อง เปลี่ยนแปลงสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๗ มิถุนายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๖ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงสารมลพิษที่วิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เพิ่มขอบข่ายชนิดสารมลพิษที่วิเคราะห์ในน้ำใต้ดิน สิ่งปฏิกูลและวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะสิ้นสุดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๒ กันยายน ๒๕๖๕

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางสาวปัทมวรรณ คุณประเสริฐ)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๖๕ ๐ ๘

ลงวันที่

๒๑

สิงหาคม ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๐ รายการ

น้ำใต้ดิน จำนวน ๔ รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aluminum	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[2]
2	Copper	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[2]
3	Iron	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[2]
4	Molybdenum	Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[2]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 17 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]

๗๖

Beryllium

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
7	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,3,6,8] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,3,7,8] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[4,5,6,8] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[4,5,7,8]
8	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Copper	3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
10	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
11	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
12	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
13	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]

อนันต์

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
14	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
15	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
16	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
17	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,3,6] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,3,7] 3) Digestion, Inductively Coupled Plasma Method ^[4,6] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]

ดิน จำนวน 19 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aluminum	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]
2	Antimony	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4,7]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
4	Barium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
5	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
6	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
7	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
8	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[4,5,6,8] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[4,5,7,8]
9	Copper	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
10	Iron	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
11	Lead	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
12	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
13	Molybdenum	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
14	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	pH	Electrometric Method ^[9]
16	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
17	Silver	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
18	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]
19	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[4,6] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4,7]

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กมลวิ

ที่ อก ๐๓๑๐(๑) ๘๐ ๑๑



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๖ กันยายน ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากร ชื่อตัวและชื่อสกุลของบุคลากร

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๑ สิงหาคม ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัดห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ชื่อตัวและชื่อสกุลของบุคลากร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

๑) นางสาวพาฤดี คุณนาน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๙

๒) นางสาวอรณิชา เทียนดำ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๔

๒. ให้เปลี่ยนชื่อตัวและชื่อสกุลของเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จากเดิม นายอาทิตย์ ศรีเสน เป็น นายรัฐธีร์ ทวีกิจวรพจน์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๘

อนึ่ง หนังสือฉบับนี้จะสิ้นอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางสาวปัทมวรรณ คุณประเสริฐ)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”





๐๔ สิงหาคม ๒๕๖๗

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์
เอกชน ลงวันที่ ๒๗ พฤษภาคม ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๓ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕
ตำบลแม่น้ำคู้ อำเภอลวกแดง จังหวัดระยอง ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน

- | | |
|--------------------------|----------------------------|
| ๑) นายเดช ช้างชน | ทะเบียนเลขที่ ว-๓๒๓-ค-๐๐๐๑ |
| ๒) นางวิลาวัลย์ บริรักษ์ | ทะเบียนเลขที่ ว-๓๒๓-ค-๐๐๐๒ |
| ๓) นายสุพจน์ สลามเต๊ะ | ทะเบียนเลขที่ ว-๓๒๓-ค-๐๐๐๓ |

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

- | | |
|--------------------------------|----------------------------|
| ๑) นายณัฐพงษ์ เพ็งขาวนา | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๑ |
| ๒) นางสาวกัลยพรรณ รักษ์ดี | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๒ |
| ๓) นางสาวจุฑารัตน์ สิททองกลาง | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๓ |
| ๔) นางสาวจิตสุภา ประเทืองสุข | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๔ |
| ๕) นายสรสรเสรีญ์ ค่อยยกสุย | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๕ |
| ๖) นายณัฐวุฒิ ออมพรมราช | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๖ |
| ๗) นายจิตรกร สีวะสา | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๗ |
| ๘) นายสิทธิปวิญญ์ สุวรรณรัตน์ | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๘ |
| ๙) นายสิทธิพันธ์ เสนาชีว | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๐๙ |
| ๑๐) นายอนุเวศน์ เตมา | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๐ |
| ๑๑) นายสุรวิทย์ นราพงษ์ | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๑ |
| ๑๒) นายณัฐพล เจียงวรวงศ์ | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๓ |
| ๑๓) นายชานนท์ บุญชื่น | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๔ |
| ๑๔) นายณัฐกานต์ วงศ์อินทร์อยู่ | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๕ |
| ๑๕) นายอานนท์ โพธิ์พระทอง | ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๖ |

๑๖) นายณัชพล...

๑๖) นายณัฏฐพล ถ้ำกลาง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๗
๑๗) นายศุภณัฐ พิสัยพันธ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๘
๑๘) นายวสันต์ คินันติ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๑๙
๑๙) นายวรัญญู ฉิมพาลี	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๐
๒๐) นายศุภณัฐ สกฤกิตติมศักดิ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๑
๒๑) นายเอกชัย ถันทอง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๒
๒๒) นายพงษ์เทพ สิทธิเลาะ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๓
๒๓) นายทินกร กุมภาชี	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๔
๒๔) นางสาวนันทิยา เบญจจันทร์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๕
๒๕) นายสิทธิชัย ยันพิมาย	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๖
๒๖) นางสาวปภาณิน หลอดทอง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๗
๒๗) นางสาวพจนา สีดา	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๘
๒๘) นางสาวธนิดา กุลศิริวงศ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๒๙
๒๙) นายพิทยา ทองแดง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๐
๓๐) นางสาวชลธิชา สุปงกช	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๑
๓๑) ว่าที่ร้อยตรี ธรณชัย ม่วงมา	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๒
๓๒) นายวรารุณ พับพา	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๓
๓๓) นายศักดิ์นรินทร์ จรัสกาย	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๔
๓๔) นายสุรศักดิ์ สาชิน	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๕
๓๕) นายสถาพร ถาแก้ว	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๖
๓๖) นายสุทธิดำรง โชคปิตินันท์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๗
๓๗) นายวัลลภ หันไชยเนาว์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๘
๓๘) นางสาววนาลี เจริญตระกูล	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๓๙
๓๙) นายธนะสิทธิ์ วงศ์ไชย	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๐
๔๐) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๑
๔๑) นายสัจจา เพ็ชรแสง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๒
๔๒) นายกัณตภณ มณีสัมพันธ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๓
๔๓) นายธารินทร์ อ็อกจินดา	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๔
๔๔) นายศุภชัย วงศ์สุริยฉาย	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๕
๔๕) นายไสว ตันโพธิ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๖
๔๖) นางสาวกิตติยา สันญาอริยาภรณ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๗
๔๖) นางสาวธิดารัตน์ ศิริมังคะโร	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๘
๔๗) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๔๙
๔๘) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๐
๔๙) นายปารามาศ สัตยาคุณ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๑
๕๐) นายนฤนาท ธรรมสระโร	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๒
๕๑) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๓

๕๒) นายพชรกร เจ็ญเจริญ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๔
๕๓) นายทิวากร เชื้อมาก	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๕
๕๔) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๖
๕๕) นายอภิชาติ วิชาส	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๗
๕๖) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๘
๕๘) นายประสานมิตร เชื้อนเพชร	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๙
๕๙) นายภาณุวัฒน์ วังบง	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๖๐
๖๐) นายสันติ ชัยชนะ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๖๑
๖๑) นายทินกร กุลชาติ	ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๖๒

ค. ขอบข่ายชนิดสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒๘ มิถุนายน ๒๕๗๑ หากประสงค์จะต่ออายุหนังสือ รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงาน อุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพริต กลนกรอง)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรู๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓
ที่ ออก ๐๓๒๐/ ๗ ๙๓ ๘ ลงวันที่ ๐๘ 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 ^[5] 2) Instrumental Analyzer Method ^[9]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[8] 2) Instrumental Analyzer Method ^[10]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Acid Method ^[5] 2) Instrumental Analyzer Method ^[11]
6	Sulfuric Acid	Isokinetic Sampling, Barium – Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

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4. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณ
เขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำของโรงงาน. ราชกิจจานุเบกษา. 4 ธันวาคม
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for New Stationary Sources. 40 CFR 60. Appendix A, 2019.

7. United States...

7. United States Environmental Protection Agency. **Standards of Performance for New Stationary Sources**. 40 CFR 60. Appendix A, 2020.

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A handwritten signature in black ink, consisting of a large, stylized 'O' followed by a horizontal line and a short vertical stroke.

ที่ อก ๐๓๒๐/ ๑๐๐๙ ๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐๔ ตุลาคม ๒๕๖๗

เรื่อง แกไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

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 ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอบลวกแดง จังหวัดระยอง ขอแก้ไขชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน เนื่องจากมีความคลาดเคลื่อน ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรม ได้รับทราบและดำเนินการแก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕ ราย ตามที่แจ้งเรียบร้อยแล้ว เป็นดังนี้

ลำดับที่ ๒๗ นางพจนา สีดา

ลำดับที่ ๒๘ นางสาวธนิศา กุลสุริวงศ์

ลำดับที่ ๓๐ นางชลธิชา สุปงกช

ลำดับที่ ๓๖ นายสุทธิดำรงค์ โชคปิตินันท์

ลำดับที่ ๔๒ นายกันตภณ มณีสัมพันธ์

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

น

(นายพรยศ กลั่นกรอง)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๑๐(๓)/ ๕๒๕๖



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๐ พฤษภาคม ๒๕๖๔

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๐ เมษายน ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอลวกแดง จังหวัดระยอง ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑ ราย ได้แก่ นายปารามาศ สัตยาคุณ ทะเบียนเลขที่ ว-๓๒๓-จ-๐๐๕๑

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม ดำรงพงษ์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



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ที่ อก ๐๓๑๐(๓)/ ๕๕๐๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๗ พฤษภาคม ๒๕๖๘

เรื่อง เปลี่ยนแปลงชื่อ-สกุลบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๕ พฤษภาคม ๒๕๖๘

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่წყ่า อำเภอปลวกแดง จังหวัดระยอง ขอเปลี่ยนแปลงชื่อ-สกุลบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อ-สกุลบุคลากร จำนวน ๑ ราย
จากนายธนสิทธิ์ วงศ์ไชย เป็น นายอมลวิษฐ์ วงศ์ไชย

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม ดำรงพงษ์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๑๐(๓)/ ๕๗๖๔



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๒ ธันวาคม ๒๕๖๔

เรื่อง เปลี่ยนแปลงสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๑ ตุลาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่แก้ว อำเภอลวกแดง จังหวัดระยอง ขอเปลี่ยนแปลงสารมลพิษที่วิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เพิ่มขอบข่ายชนิดสารมลพิษที่วิเคราะห์ในน้ำเสีย และน้ำใต้ดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะสิ้นอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๒๘ มิถุนายน ๒๕๗๑

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางสาวปัทมวรรณ คุณประเสริฐ)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓

ที่ อก ๐๓๑๐(๓)/ ๙๗๖๔

ลงวันที่ ๐๒ ธันวาคม ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๓ รายการ

น้ำเสีย จำนวน 13 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma Method
2	Barium	Digestion, Inductively Coupled Plasma Method
3	Cadmium	Digestion, Inductively Coupled Plasma Method
4	Chromium	Digestion, Inductively Coupled Plasma Method
5	Copper	Digestion, Inductively Coupled Plasma Method
6	Hexavalent Chromium	Colorimetric Method
7	Lead	Digestion, Inductively Coupled Plasma Method
8	Manganese	Digestion, Inductively Coupled Plasma Method
9	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method
10	Nickel	Digestion, Inductively Coupled Plasma Method
11	Selenium	Digestion, Inductively Coupled Plasma Method
12	Trivalent Chromium	Calculation
13	Zinc	Digestion, Inductively Coupled Plasma Method

น้ำใต้ดิน จำนวน 20 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aluminum	Digestion, Inductively Coupled Plasma Method
2	Antimony	Digestion, Inductively Coupled Plasma Method
3	Arsenic	Digestion, Inductively Coupled Plasma Method
4	Barium	Digestion, Inductively Coupled Plasma Method
5	Beryllium	Digestion, Inductively Coupled Plasma Method
6	Cadmium	Digestion, Inductively Coupled Plasma Method
7	Chromium	Digestion, Inductively Coupled Plasma Method
8	Chromium (III)	Calculation
9	Chromium (VI)	Colorimetric Method
10	Copper	Digestion, Inductively Coupled Plasma Method

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Iron	Digestion, Inductively Coupled Plasma Method
12	Lead	Digestion, Inductively Coupled Plasma Method
13	Manganese	Digestion, Inductively Coupled Plasma Method
14	Mercury	Digestion Cold-Vapor Atomic Absorption Spectrometric Method
15	Molybdenum	Digestion, Inductively Coupled Plasma Method
16	Nickel	Digestion, Inductively Coupled Plasma Method
17	Selenium	Digestion, Inductively Coupled Plasma Method
18	Silver	Digestion, Inductively Coupled Plasma Method
19	Vanadium	Digestion, Inductively Coupled Plasma Method
20	Zinc	Digestion, Inductively Coupled Plasma Method

เอกสารอ้างอิง

APHA, AWWA, WEF. **Standard Methods for the Examination of Water and Wastewater**. 24th ed. Washington, DC: APHA, 2023.



บริษัท ไทย เอ็มเอ็มเอ จำกัด
เลขที่ 88/6 นิคมอุตสาหกรรม อาร์ ไอ แอล
ตำบลมาบตาพุด อำเภอเมืองระยอง จังหวัดระยอง 21150 โทรศัพท์ +66(0)38-911835



บริษัท เอแอลเอส แลborาทอรี กรุ๊ป (ประเทศไทย) จำกัด
104 ซอยพัฒนาการ 40 ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพฯ 10250
โทรศัพท์ 0-2760-3000 โทรสาร 0-2760-3197
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