

ภาคผนวก ค

ใบรับรองผลการวิเคราะห์



Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397658

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2751419-1

Page 1 of 1

Sample Description Air Quality
Location วัดหนองแฟบ (GPS 47P 0729830, 1403321)
Parameter Nitrogen dioxide (ppm)
Measurement Date Sep 10, 2023 - Sep 17, 2023
Measurement by Chatchai Sukpia

	2397658-1 Sep 10, 2023	2397658-2 Sep 11, 2023	2397658-3 Sep 12, 2023	2397658-4 Sep 13, 2023	2397658-5 Sep 14, 2023	2397658-6 Sep 15, 2023	2397658-7 Sep 16, 2023
Time							
11:00 AM - 12:00 PM	0.006	0.013	0.010	0.014	0.014	0.012	0.006
12:00 PM - 01:00 PM	0.006	0.012	0.011	0.013	0.014	0.012	0.006
01:00 PM - 02:00 PM	0.006	0.009	0.008	0.007	0.009	0.008	0.006
02:00 PM - 03:00 PM	0.006	0.008	0.007	0.005	0.007	0.006	0.005
03:00 PM - 04:00 PM	0.010	0.007	0.007	0.005	0.007	0.006	0.005
04:00 PM - 05:00 PM	0.009	0.007	0.006	0.004	0.006	0.006	0.006
05:00 PM - 06:00 PM	0.009	0.006	0.006	0.004	0.005	0.006	0.006
06:00 PM - 07:00 PM	0.009	0.006	0.006	0.003	0.005	0.005	0.004
07:00 PM - 08:00 PM	0.009	0.006	0.005	0.003	0.004	0.005	0.003
08:00 PM - 09:00 PM	0.010	0.011	0.004	0.003	0.005	0.005	0.004
09:00 PM - 10:00 PM	0.012	0.007	0.005	0.004	0.005	0.006	0.004
10:00 PM - 11:00 PM	0.015	0.007	0.005	0.004	0.008	0.005	0.004
11:00 PM - 12:00 AM	0.018	0.007	0.005	0.004	0.008	0.006	0.004
12:00 AM - 01:00 AM	0.017	0.006	0.006	0.004	0.006	0.006	0.003
01:00 AM - 02:00 AM	0.017	0.006	0.006	0.004	0.008	0.006	0.004
02:00 AM - 03:00 AM	0.016	0.007	0.006	0.004	0.008	0.005	0.005
03:00 AM - 04:00 AM	0.015	0.007	0.006	0.004	0.009	0.005	0.005
04:00 AM - 05:00 AM	0.014	0.007	0.006	0.005	0.009	0.005	0.005
05:00 AM - 06:00 AM	0.014	0.007	0.006	0.006	0.010	0.006	0.005
06:00 AM - 07:00 AM	0.013	0.007	0.006	0.008	0.010	0.006	0.005
07:00 AM - 08:00 AM	0.012	0.007	0.006	0.009	0.009	0.005	0.005
08:00 AM - 09:00 AM	0.012	0.007	0.006	0.009	0.008	0.005	0.005
09:00 AM - 10:00 AM	0.012	0.007	0.006	0.011	0.008	0.005	0.005
10:00 AM - 11:00 AM	0.012	0.007	0.007	0.011	0.008	0.005	0.005
Average	0.012	0.008	0.006	0.006	0.008	0.006	0.005
1hr - Maximum	0.018	0.013	0.011	0.014	0.014	0.012	0.006
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).
Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

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Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company



Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397658

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2786441-1

Page 1 of 1

Sample Description Air Quality
Location วัดมาบชลด (GPS 47P 0730831, 1407365)
Parameter Nitrogen dioxide (ppm)
Measurement Date Sep 10, 2023 - Sep 17, 2023
Measurement by Chatchai Sukpia

Time	2397658-8 Sep 10, 2023	2397658-9 Sep 11, 2023	2397658-10 Sep 12, 2023	2397658-11 Sep 13, 2023	2397658-12 Sep 14, 2023	2397658-13 Sep 15, 2023	2397658-14 Sep 16, 2023
12:00 PM - 01:00 PM	0.006	0.012	0.011	0.013	0.014	0.012	0.006
01:00 PM - 02:00 PM	0.005	0.012	0.012	0.013	0.014	0.012	0.007
02:00 PM - 03:00 PM	0.005	0.008	0.009	0.007	0.009	0.008	0.006
03:00 PM - 04:00 PM	0.006	0.007	0.008	0.005	0.007	0.006	0.006
04:00 PM - 05:00 PM	0.009	0.006	0.006	0.006	0.007	0.006	0.006
05:00 PM - 06:00 PM	0.007	0.007	0.005	0.006	0.006	0.006	0.007
06:00 PM - 07:00 PM	0.008	0.006	0.005	0.006	0.006	0.006	0.007
07:00 PM - 08:00 PM	0.008	0.006	0.005	0.006	0.005	0.005	0.006
08:00 PM - 09:00 PM	0.008	0.006	0.005	0.006	0.005	0.006	0.006
09:00 PM - 10:00 PM	0.009	0.011	0.006	0.006	0.005	0.006	0.006
10:00 PM - 11:00 PM	0.008	0.007	0.006	0.008	0.006	0.006	0.006
11:00 PM - 12:00 AM	0.009	0.007	0.006	0.008	0.009	0.005	0.006
12:00 AM - 01:00 AM	0.007	0.007	0.005	0.007	0.008	0.006	0.006
01:00 AM - 02:00 AM	0.007	0.006	0.005	0.007	0.007	0.006	0.005
02:00 AM - 03:00 AM	0.006	0.007	0.005	0.006	0.008	0.006	0.005
03:00 AM - 04:00 AM	0.006	0.007	0.005	0.006	0.009	0.005	0.005
04:00 AM - 05:00 AM	0.005	0.008	0.005	0.006	0.010	0.005	0.006
05:00 AM - 06:00 AM	0.004	0.008	0.005	0.006	0.010	0.005	0.005
06:00 AM - 07:00 AM	0.005	0.008	0.005	0.006	0.011	0.006	0.005
07:00 AM - 08:00 AM	0.004	0.008	0.005	0.008	0.011	0.005	0.005
08:00 AM - 09:00 AM	0.004	0.008	0.005	0.009	0.010	0.005	0.005
09:00 AM - 10:00 AM	0.004	0.008	0.005	0.009	0.008	0.005	0.005
10:00 AM - 11:00 AM	0.005	0.008	0.006	0.011	0.008	0.005	0.005
11:00 AM - 12:00 PM	0.010	0.008	0.006	0.011	0.008	0.006	0.006
Average	0.006	0.008	0.006	0.008	0.008	0.006	0.006
1hr - Maximum	0.010	0.012	0.012	0.013	0.014	0.012	0.007
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).
Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

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Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

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ALS LABORATORY GROUP (THAILAND) CO., LTD. An ALS Limited Company



Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397662

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2751421-1

Page 1 of 1

Sample Description Air Quality
Location วัดหนองแฟบ (GPS 47P 0729830, 1403321)
Date Analysis Commenced Sep 19, 2023
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2397662-1	Sep 10 - Sep 11, 2023	0.028	755	31
2397662-2	Sep 11 - Sep 12, 2023	0.029	755	30
2397662-3	Sep 12 - Sep 13, 2023	0.028	755	32
2397662-4	Sep 13 - Sep 14, 2023	0.038	755	32
2397662-5	Sep 14 - Sep 15, 2023	0.024	755	30
2397662-6	Sep 15 - Sep 16, 2023	0.020	755	30
2397662-7	Sep 16 - Sep 17, 2023	0.017	755	30
Guideline		0.33	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

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

Sampled By : Chatchai Sukpia

Remark :

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

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Life Sciences

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397662

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2751421-2

Page 1 of 1

Sample Description Air Quality
Location วัดนาบขลุ่ย (GPS 47P 0730831, 1407365)
Date Analysis Commenced Sep 19, 2023
Condition of Sample Drawn into one glass filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2397662-8	Sep 10 - Sep 11, 2023	0.084	755	31
2397662-9	Sep 11 - Sep 12, 2023	0.097	755	30
2397662-10	Sep 12 - Sep 13, 2023	0.091	755	32
2397662-11	Sep 13 - Sep 14, 2023	0.070	755	32
2397662-12	Sep 14 - Sep 15, 2023	0.051	755	30
2397662-13	Sep 15 - Sep 16, 2023	0.096	755	30
2397662-14	Sep 16 - Sep 17, 2023	0.070	755	30
Guideline		0.33	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

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

Sampled By : Chatchai Sukpia

Remark :

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

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397695
Date Received : Sep 18, 2023
Date Reported : Sep 27, 2023
Report Number : 2751436-1

Page 1 of 2

Sample Number : 2397695-1 to 7
Parameter : Wind Speed / Wind Direction
Location : วัดหนองแฟบ (GPS 47P 0729830, 1403321)
Sampling Date : Sep 10 - Sep 17, 2023
Sampling by : Chatchai Sukpia

Time	Sep 10 - Sep 11, 2023			Sep 11 - Sep 12, 2023			Sep 12 - Sep 13, 2023			Sep 13 - Sep 14, 2023			Sep 14 - Sep 15, 2023			Sep 15 - Sep 16, 2023			Sep 16 - Sep 17, 2023		
	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)	
11:00 AM - 12:00 PM	2.4	146.0	SE	3.0	210.0	SSW	2.4	287.0	WNW	2.6	296.0	WNW	2.0	274.0	W	2.2	305.0	NW	1.1	258.0	WSW
12:00 PM - 01:00 PM	2.9	289.0	WNW	2.4	273.0	W	3.0	284.0	WNW	3.0	258.0	WSW	2.4	286.0	WNW	2.3	287.0	WNW	2.3	317.0	NW
01:00 PM - 02:00 PM	3.2	256.0	WSW	2.6	261.0	W	2.4	286.0	WNW	2.4	310.0	NW	2.6	287.0	WNW	2.4	238.0	WSW	0.8	288.0	WNW
02:00 PM - 03:00 PM	3.5	312.0	NW	3.0	216.0	SW	3.2	251.0	WSW	3.0	206.0	SSW	2.8	275.0	W	2.8	259.0	W	0.8	230.0	SW
03:00 PM - 04:00 PM	3.4	229.0	SW	2.4	254.0	WSW	3.0	280.0	W	2.8	265.0	W	3.0	239.0	WSW	3.2	191.0	S	0.9	279.0	W
04:00 PM - 05:00 PM	3.2	241.0	WSW	3.1	220.0	SW	2.3	258.0	WSW	2.8	283.0	WNW	3.0	233.0	SW	3.0	270.0	W	1.4	223.0	SW
05:00 PM - 06:00 PM	2.9	277.0	W	3.2	299.0	WNW	3.0	292.0	WNW	2.3	271.0	W	3.2	285.0	WNW	3.1	272.0	W	0.6	236.0	SW
06:00 PM - 07:00 PM	2.2	301.0	WNW	3.2	272.0	W	2.8	287.0	WNW	3.0	285.0	WNW	2.6	301.0	WNW	3.3	301.0	WNW	1.1	301.0	WNW
07:00 PM - 08:00 PM	3.0	289.0	WNW	2.3	248.0	WSW	2.6	294.0	WNW	2.2	276.0	W	2.0	287.0	WNW	3.3	328.0	NNW	1.5	314.0	NW
08:00 PM - 09:00 PM	3.3	287.0	WNW	2.8	258.0	WSW	2.8	307.0	NW	2.2	228.0	SW	1.6	339.0	NNW	2.2	288.0	WNW	0.5	311.0	NW
09:00 PM - 10:00 PM	2.3	303.0	WNW	3.0	288.0	WNW	2.2	306.0	NW	1.6	240.0	WSW	2.6	356.0	N	2.4	288.0	WNW	0.9	320.0	NW
10:00 PM - 11:00 PM	3.2	277.0	W	3.0	271.0	W	1.8	306.0	NW	1.4	299.0	WNW	1.5	343.0	NNW	2.2	293.0	WNW	2.0	299.0	WNW
11:00 PM - 12:00 AM	3.2	313.0	NW	2.2	313.0	NW	2.0	308.0	NW	1.6	312.0	NW	0.3	348.0	NNW	2.4	290.0	WNW	2.8	258.0	WSW
12:00 AM - 01:00 AM	3.0	289.0	WNW	2.0	334.0	NNW	2.4	298.0	WNW	1.2	294.0	WNW	0.6	315.0	NW	2.2	313.0	NW	1.3	293.0	WNW
01:00 AM - 02:00 AM	2.8	289.0	WNW	2.6	318.0	NW	1.6	304.0	NW	8.0	298.0	WNW	0.4	312.0	NW	1.5	314.0	NW	0.3	292.0	WNW
02:00 AM - 03:00 AM	2.5	295.0	WNW	2.4	281.0	W	1.4	275.0	W	0.3	296.0	WNW	0.5	305.0	NW	1.2	299.0	WNW	0.7	278.0	W
03:00 AM - 04:00 AM	2.4	311.0	NW	2.8	294.0	WNW	1.9	281.0	W	0.1	-	-	0.3	316.0	NW	0.7	301.0	WNW	1.4	284.0	WNW
04:00 AM - 05:00 AM	1.2	358.0	N	3.0	288.0	WNW	2.0	270.0	W	0.5	326.0	NW	1.6	222.0	SW	0.7	261.0	W	0.4	288.0	WNW
05:00 AM - 06:00 AM	0.8	329.0	NNW	2.6	348.0	NNW	2.0	311.0	NW	0.8	296.0	WNW	1.8	307.0	NW	0.2	-	-	1.6	294.0	WNW
06:00 AM - 07:00 AM	0.8	317.0	NW	2.8	298.0	WNW	1.6	292.0	WNW	0.4	312.0	NW	1.2	287.0	WNW	0.6	327.0	NNW	1.5	326.0	NW
07:00 AM - 08:00 AM	0.6	353.0	N	3.0	303.0	WNW	1.4	307.0	NW	0.6	320.0	NW	1.4	314.0	NW	1.5	277.0	W	3.1	319.0	NW
08:00 AM - 09:00 AM	1.5	257.0	WSW	2.2	287.0	WNW	2.0	267.0	W	1.4	290.0	WNW	1.8	301.0	WNW	1.2	281.0	W	2.2	291.0	WNW
09:00 AM - 10:00 AM	2.2	270.0	W	2.5	291.0	WNW	2.4	283.0	WNW	1.8	302.0	WNW	2.0	277.0	W	0.9	246.0	WSW	2.0	280.0	W
10:00 AM - 11:00 AM	2.6	294.0	WNW	3.0	273.0	W	2.2	267.0	W	1.8	287.0	WNW	2.4	315.0	NW	0.6	264.0	W	0.8	268.0	W

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



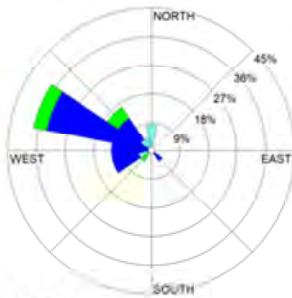
Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

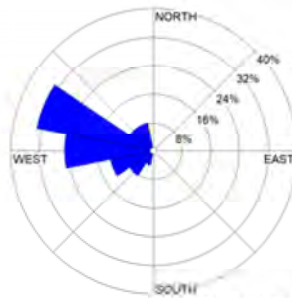
Lot ID: 2397695
Date Received : Sep 18, 2023
Date Reported : Sep 27, 2023
Report Number : 2751436-1

Page 2 of 2

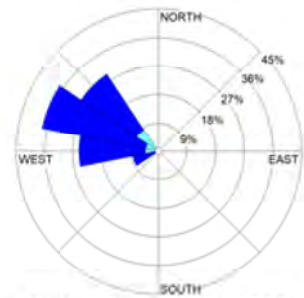
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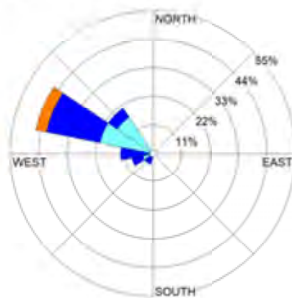
Date : Sep 10-11, 2023



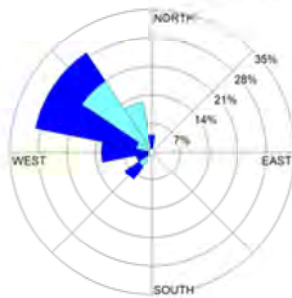
Date : Sep 11-12, 2023



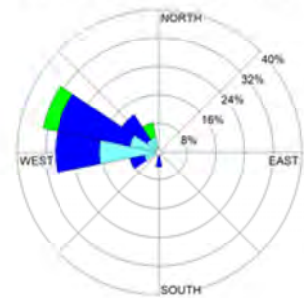
Date : Sep 12-13, 2023



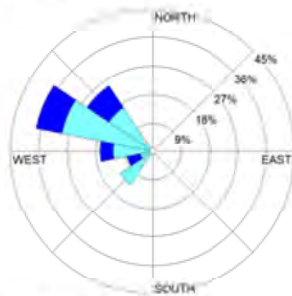
Date : Sep 13-14, 2023



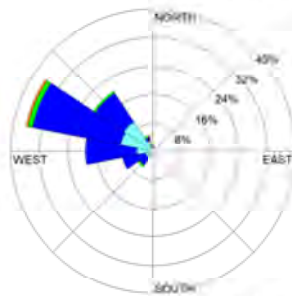
Date : Sep 14-15, 2023



Date : Sep 15-16, 2023



Date : Sep 16-17, 2023



Date : Sep 10-17, 2023

WS(m/s)	%
≥ 10.0	0.00
8.0-10.0	0.60
5.5-8.0	0.00
3.3-5.5	2.98
1.7-3.3	61.91
0.3-1.7	33.33
Calms	1.19

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Approved by

Sarayuth Jittrantont
Assistant General Manager



Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397705
Date Received : Sep 12, 2023
Date Reported : Sep 21, 2023
Report Number : 2751490-1

Page 1 of 1

Sample Number : 2397705-1
Sample Description : Emission from Stationary Source
Location : HRSG #1
Measurement Date : Sep 12, 2023

Stack Description

Ambient Temperature	32 °C	Diameter	3.30 m	Oxygen	14.18 %
Ambient Pressure	755 mmHg	Shape	Circle	Carbon dioxide	3.75 %
Type of Process	Combustion	Stack Temperature	156 °C	Gas Velocity	21.28 m/s
Type of Fuel	Natural Gas	Moisture	7.66 %	Flow Rate	417219 Nm ³ /hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	10:15 AM - 10:35 AM	14.10	3.79	7.36	15.04
2	10:36 AM - 10:56 AM	14.19	3.74	6.89	14.29
3	10:57 AM - 11:17 AM	14.25	3.71	6.72	14.04
Average (ppm)		14.18	3.75	6.99	14.46
Guideline ^{1/} (ppm)				-	35
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				13.15	27.20
Emission Rate at Actual O ₂ (g/s)				1.5243	
Guideline ^{1/} (g/s)				3.55	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Technical Management

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Approved by

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397738

Date Received : Sep 12, 2023

Date Reported : Sep 20, 2023

Report Number: 2751505-1

Page 1 of 2

Sample Number 2397738-1
Sampled Date Sep 12, 2023
Sample Description Emission from Stationary Source
Location HRSG #1
Date Analysis Commenced Sep 14, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	756	mmHg	Diameter	3.30	m	Oxygen	14.2	%
Ambient Temperature	31.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	156	°C	Gas Velocity	21.2	m/s
Type of Fuel	Natural Gas		Moisture	7.60	%	Flow Rate (Actual O2)	417198	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 14.2 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	10:15 AM - 10:57 AM	mg/m3	-	0.5	<0.5	<0.5	60	3.20	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

ทะเบียนเลขที่ ว-323-จ-9447

Approved by

D. Changchon

Dej Changchon
Senior Manager

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397738

Date Received : Sep 12, 2023

Date Reported : Sep 20, 2023

Report Number: 2751505-1

Page 2 of 2

Sample Number 2397738-1
Sampled Date Sep 12, 2023
Sample Description Emission from Stationary Source
Location HRSG #1
Date Analysis Commenced Sep 14, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	756	mmHg	Diameter	3.30	m	Oxygen	14.2	%
Ambient Temperature	31.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	156	°C	Gas Velocity	21.2	m/s
Type of Fuel	Natural Gas		Moisture	7.60	%	Flow Rate (Actual O2)	417198	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	10:15 AM - 10:57 AM	g/s	-	-	<0.058	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Sutdamrong Chokpitinan , Warawut Pubpa

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.

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397706
Date Received : Sep 13, 2023
Date Reported : Sep 21, 2023
Report Number : 2751482-1

Page 1 of 1

Sample Number : 2397706-1
Sample Description : Emission from Stationary Source
Location : HRSG #2
Measurement Date : Sep 13, 2023

Stack Description

Ambient Temperature	32 °C	Diameter	3.30 m	Oxygen	13.70 %
Ambient Pressure	755 mmHg	Shape	Circle	Carbon dioxide	4.04 %
Type of Process	Combustion	Stack Temperature	156 °C	Gas Velocity	21.28 m/s
Type of Fuel	Natural Gas	Moisture	7.85 %	Flow Rate	416304 Nm ³ /hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	10:10 AM - 10:30 AM	13.70	4.04	11.38	21.96
2	10:31 AM - 10:51 AM	13.72	4.03	11.07	21.42
3	10:52 AM - 11:12 AM	13.69	4.04	11.21	21.63
Average (ppm)		13.70	4.04	11.22	21.67
Guideline ^{1/} (ppm)				-	35
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				21.11	40.77
Emission Rate at Actual O ₂ (g/s)				2.4409	
Guideline ^{1/} (g/s)				3.55	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397739

Date Received : Sep 13, 2023

Date Reported : Sep 20, 2023

Report Number: 2751502-1

Page 1 of 2

Sample Number 2397739-1
Sampled Date Sep 13, 2023
Sample Description Emission from Stationary Source
Location HRSG #2
Date Analysis Commenced Sep 14, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	156	°C	Gas Velocity	21.3	m/s
Type of Fuel	Natural Gas		Moisture	7.86	%	Flow Rate (Actual O2)	415743	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 13.7 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	10:15 AM - 10:57 AM	mg/m3	-	0.5	<0.5	<0.5	60	3.20	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
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P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397739

Date Received : Sep 13, 2023

Date Reported : Sep 20, 2023

Report Number: 2751502-1

Page 2 of 2

Sample Number 2397739-1
Sampled Date Sep 13, 2023
Sample Description Emission from Stationary Source
Location HRSG #2
Date Analysis Commenced Sep 14, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	156	°C	Gas Velocity	21.3	m/s
Type of Fuel	Natural Gas		Moisture	7.86	%	Flow Rate (Actual O2)	415743	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	10:15 AM - 10:57 AM	g/s	-	-	<0.058	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
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Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Sutdamrong Chokpitinan , Warawut Pubpa

Remark :

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

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397747
Date Received : Sep 13, 2023
Date Reported : Sep 21, 2023
Report Number : 2751526-1

Page 1 of 1

Sample Number : 2397747-1
Sample Description : Emission from Stationary Source
Location : HRSG #3
Measurement Date : Sep 13, 2023

Stack Description

Ambient Temperature	32 °C	Diameter	3.30 m	Oxygen	14.11 %
Ambient Pressure	755 mmHg	Shape	Circle	Carbon dioxide	3.80 %
Type of Process	Combustion	Stack Temperature	128 °C	Gas Velocity	20.17 m/s
Type of Fuel	Natural Gas	Moisture	7.55 %	Flow Rate	423483 Nm ³ /hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	12:15 PM - 12:35 PM	14.13	3.79	11.16	22.92
2	12:36 PM - 12:56 PM	14.10	3.80	11.18	22.87
3	12:57 PM - 01:17 PM	14.11	3.80	11.41	23.34
Average (ppm)		14.11	3.80	11.25	23.05
Guideline ^{1/} (ppm)				-	48
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				21.17	43.36
Emission Rate at Actual O ₂ (g/s)				2.4901	
Guideline ^{1/} (g/s)				5.07	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397755

Date Received : Sep 13, 2023

Date Reported : Sep 20, 2023

Report Number: 2751535-1

Page 1 of 2

Sample Number 2397755-1
Sampled Date Sep 13, 2023
Sample Description Emission from Stationary Source
Location HRSG #3
Date Analysis Commenced Sep 14, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	14.1	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	128	°C	Gas Velocity	20.2	m/s
Type of Fuel	Natural Gas		Moisture	7.66	%	Flow Rate (Actual O2)	422581	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 14.1 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	12:15 PM - 12:57 PM	mg/m3	-	0.5	<0.5	<0.5	60	3.00	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397755

Date Received : Sep 13, 2023

Date Reported : Sep 20, 2023

Report Number: 2751535-1

Page 2 of 2

Sample Number	2397755-1
Sampled Date	Sep 13, 2023
Sample Description	Emission from Stationary Source
Location	HRSG #3
Date Analysis Commenced	Sep 14, 2023
Condition of Sample	Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	14.1	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	128	°C	Gas Velocity	20.2	m/s
Type of Fuel	Natural Gas		Moisture	7.66	%	Flow Rate (Actual O2)	422581	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	12:15 PM - 12:57 PM	g/s	-	-	<0.059	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Sutdamrong Chokpitinan , Warawut Pubpa

Remark :

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Technical Management

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397748
Date Received : Sep 15, 2023
Date Reported : Sep 21, 2023
Report Number : 2751521-1

Page 1 of 1

Sample Number : 2397748-1
Sample Description : Emission from Stationary Source
Location : HRSG #4 (GPS 47P 0730798, 1404983)
Measurement Date : Sep 15, 2023

Stack Description

Ambient Temperature	30 °C	Diameter	3.30 m	Oxygen	13.74 %
Ambient Pressure	754 mmHg	Shape	Circle	Carbon dioxide	4.03 %
Type of Process	Combustion	Stack Temperature	127 °C	Gas Velocity	20.23 m/s
Type of Fuel	Natural Gas	Moisture	7.36 %	Flow Rate	426008 Nm ³ /hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	11:55 AM - 12:15 PM	13.73	4.04	6.38	12.37
2	12:16 PM - 12:36 PM	13.73	4.03	6.75	13.10
3	12:37 PM - 12:57 PM	13.74	4.02	6.44	12.50
Average (ppm)		13.74	4.03	6.52	12.66
Guideline ^{1/} (ppm)				-	32
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				12.27	23.81
Emission Rate at Actual O ₂ (g/s)				1.4524	
Guideline ^{1/} (g/s)				2.84	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Technical Management

Wichan Choonharat
Manager
ทะเบียนเลขที่ ว-204-ค-6113

Approved by

Sarayuth Jittrantont
Assistant General Manager
ทะเบียนเลขที่ ว-204-ค-4702

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397754

Date Received : Sep 15, 2023

Date Reported : Sep 23, 2023

Report Number: 2751542-1

Page 1 of 2

Sample Number 2397754-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location HRSG #4
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	754	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	127	°C	Gas Velocity	20.2	m/s
Type of Fuel	Natural Gas		Moisture	7.39	%	Flow Rate (Actual O2)	425402	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 13.7 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	11:55 AM - 12:43 PM	mg/m3	-	0.5	<0.5	<0.5	60	3.60	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

ทะเบียนเลขที่ ว-323-จ-9447

Approved by

D. Changchon

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397754
Date Received : Sep 15, 2023
Date Reported : Sep 23, 2023
Report Number: 2751542-1

Page 2 of 2

Sample Number 2397754-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location HRSG #4
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	754	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	127	°C	Gas Velocity	20.2	m/s
Type of Fuel	Natural Gas		Moisture	7.39	%	Flow Rate (Actual O2)	425402	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	11:55 AM - 12:43 PM	g/s	-	-	<0.059	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Kantaphon Maneesampan , Pipat Nipatsed

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

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S:\Reports_Air Stack_O2_2GL.rpt (9:58AM)



Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397749
Date Received : Sep 15, 2023
Date Reported : Sep 21, 2023
Report Number : 2751516-1

Page 1 of 1

Sample Number : 2397749-1
Sample Description : Emission from Stationary Source
Location : HRSG #5 (GPS 47P 0730892, 1405132)
Measurement Date : Sep 15, 2023

Stack Description

Ambient Temperature	30 °C	Diameter	3.30 m	Oxygen	13.70 %
Ambient Pressure	754 mmHg	Shape	Circle	Carbon dioxide	4.05 %
Type of Process	Combustion	Stack Temperature	176 °C	Gas Velocity	23.39 m/s
Type of Fuel	Natural Gas	Moisture	7.60 %	Flow Rate	437758 Nm ³ /hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	01:20 PM - 01:40 PM	13.69	4.06	2.25	4.35
2	01:41 PM - 02:01 PM	13.71	4.04	2.25	4.35
3	02:02 PM - 02:22 PM	13.71	4.05	2.28	4.42
Average (ppm)		13.70	4.05	2.26	4.37
Guideline ^{1/} (ppm)				-	20
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				4.26	8.23
Emission Rate at Actual O ₂ (g/s)				0.5179	
Guideline ^{1/} (g/s)				2.82	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

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Approved by

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397753

Date Received : Sep 15, 2023

Date Reported : Sep 23, 2023

Report Number: 2751544-1

Page 1 of 2

Sample Number 2397753-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location HRSG #5
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	754	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	176	°C	Gas Velocity	23.4	m/s
Type of Fuel	Natural Gas		Moisture	7.65	%	Flow Rate (Actual O2)	437054	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 13.7 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	01:25 PM - 02:13 PM	mg/m3	-	0.5	<0.5	<0.5	60	2.30	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Approved by

D. Changchon

Dej Changchon
Senior Manager

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397753

Date Received : Sep 15, 2023

Date Reported : Sep 23, 2023

Report Number: 2751544-1

Page 2 of 2

Sample Number 2397753-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location HRSG #5
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish, one plastic bottle and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	754	mmHg	Diameter	3.30	m	Oxygen	13.7	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	4.0	%
Type of Process	Combustion		Stack Temperature	176	°C	Gas Velocity	23.4	m/s
Type of Fuel	Natural Gas		Moisture	7.65	%	Flow Rate (Actual O2)	437054	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	01:25 PM - 02:13 PM	g/s	-	-	<0.061	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Kantaphon Maneesampan , Pipat Nipatsed

Remark :

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

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397750
Date Received : Sep 14, 2023
Date Reported : Sep 21, 2023
Report Number : 2751512-1

Page 1 of 1

Sample Number : 2397750-1
Sample Description : Emission from Stationary Source
Location : HRSG #6 (GPS 47P 0730759, 1405004)
Measurement Date : Sep 14, 2023

Stack Description

Ambient Temperature	32 °C	Diameter	3.30 m	Oxygen	14.18 %
Ambient Pressure	755 mmHg	Shape	Circle	Carbon dioxide	3.85 %
Type of Process	Combustion	Stack Temperature	175 °C	Gas Velocity	23.42 m/s
Type of Fuel	Natural Gas	Moisture	7.49 %	Flow Rate	440225 Nm3/hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	11:45 AM - 12:05 PM	14.18	3.85	5.75	11.91
2	12:06 PM - 12:26 PM	14.15	3.86	5.44	11.21
3	12:27 PM - 12:47 PM	14.20	3.85	5.06	10.50
Average (ppm)		14.18	3.85	5.42	11.21
Guideline ^{1/} (ppm)				-	20
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				10.19	21.08
Emission Rate at Actual O ₂ (g/s)				1.2465	
Guideline ^{1/} (g/s)				2.82	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

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Technical Management

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Approved by

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397752
Date Received : Sep 14, 2023
Date Reported : Sep 20, 2023
Report Number: 2751549-1

Page 1 of 2

Sample Number 2397752-1
Sampled Date Sep 14, 2023
Sample Description Emission from Stationary Source
Location HRSG #6
Date Analysis Commenced Sep 15, 2023

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	14.2	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	75.0	°C	Gas Velocity	20.6	m/s
Type of Fuel	Natural Gas		Moisture	7.47	%	Flow Rate (Actual O2)	498959	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂	Result at 14.2 % O ₂	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing										
Total Suspended Particulate	11:45 AM - 12:33 PM	mg/m3	-	0.5	<0.5	<0.5	60	2.30	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
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Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

Thanita K.

Thanita Kulsuriwong
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Approved by

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397752
Date Received : Sep 14, 2023
Date Reported : Sep 20, 2023
Report Number: 2751549-1

Page 2 of 2

Sample Number 2397752-1
Sampled Date Sep 14, 2023
Sample Description Emission from Stationary Source
Location HRSG #6
Date Analysis Commenced Sep 15, 2023

Stack Description

Ambient Pressure	755	mmHg	Diameter	3.30	m	Oxygen	14.2	%
Ambient Temperature	32.0	°C	Shape	Circle		Carbon Dioxide	3.8	%
Type of Process	Combustion		Stack Temperature	75.0	°C	Gas Velocity	20.6	m/s
Type of Fuel	Natural Gas		Moisture	7.47	%	Flow Rate (Actual O2)	498959	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	11:45 AM - 12:33 PM	g/s	-	-	<0.069	-	0.40	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
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Sampled By : Kantaphon Maneesampan , Pipat Nipatsed

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Technical Management

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397707
Date Received : Sep 15, 2023
Date Reported : Sep 21, 2023
Report Number : 2751440-1

Page 1 of 1

Sample Number : 2397707-1
Sample Description : Emission from Stationary Source
Location : Auxiliary Boiler
Measurement Date : Sep 15, 2023

Stack Description

Ambient Temperature	30 °C	Diameter	1.80 m	Oxygen	8.80 %
Ambient Pressure	754 mmHg	Shape	Circle	Carbon dioxide	6.95 %
Type of Process	Combustion	Stack Temperature	169 °C	Gas Velocity	5.70 m/s
Type of Fuel	Natural Gas	Moisture	10.72 %	Flow Rate	31133 Nm3/hr

Run No.	Sampling Time	Oxygen (%)	Carbon Dioxide (%)	Oxides of Nitrogen (ppm)	
				at Actual O ₂	At 7% O ₂
1	10:00 AM - 10:20 AM	8.80	6.94	31.26	35.92
2	10:21 AM - 10:41 AM	8.80	6.96	31.42	36.09
3	10:42 AM - 11:02 AM	8.79	6.96	31.08	35.67
Average (ppm)		8.80	6.95	31.26	35.89
Guideline ^{1/} (ppm)				-	53
Guideline ^{2/} (ppm)				-	120
Guideline ^{3/} (ppm)				-	120
Result (mg/Nm ³)				58.80	67.53
Emission Rate at Actual O ₂ (g/s)				0.5085	
Guideline ^{1/} (g/s)				2.10	
Method				US EPA Method 7E	

Sampled By : Saksit Phaisanphisut

Guideline : ^{1/} Environmental Impact Assessment Report of Global Power Synergy Public Company Limited (CUP 1)

^{2/} Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).

^{3/} Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

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TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397740

Date Received : Sep 15, 2023

Date Reported : Sep 23, 2023

Report Number: 2751493-1

Page 1 of 2

Sample Number 2397740-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location Auxiliary Boiler
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	754	mmHg	Diameter	1.80	m	Oxygen	8.8	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	7.0	%
Type of Process	Combustion		Stack Temperature	169	°C	Gas Velocity	5.7	m/s
Type of Fuel	Natural Gas		Moisture	10.72	%	Flow Rate (Actual O2)	31098	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result		Guideline (1)	Guideline (2)	Method	Testing Location
					at 7 %O ₂	at 8.8 % O ₂				
Air Testing										
Total Suspended Particulate	10:00 AM - 10:48 AM	mg/m3	-	0.5	<0.5	<0.5	60	1.20	United States Environmental Protection Agency, EPA Method 5	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

ทะเบียนเลขที่ ว-323-จ-9447

Approved by

D. Changchon

Dej Changchon
Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397740

Date Received : Sep 15, 2023
Date Reported : Sep 23, 2023
Report Number: 2751493-1

Page 2 of 2

Sample Number 2397740-1
Sampled Date Sep 15, 2023
Sample Description Emission from Stationary Source
Location Auxiliary Boiler
Date Analysis Commenced Sep 16, 2023
Condition of Sample Extracted into one filter paper placed in plastic petri dish and one plastic bottle

Stack Description

Ambient Pressure	754	mmHg	Diameter	1.80	m	Oxygen	8.8	%
Ambient Temperature	30.0	°C	Shape	Circle		Carbon Dioxide	7.0	%
Type of Process	Combustion		Stack Temperature	169	°C	Gas Velocity	5.7	m/s
Type of Fuel	Natural Gas		Moisture	10.72	%	Flow Rate (Actual O2)	31098	Nm3/hr

Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result Emission Rate	Guideline (1)	Guideline (2)	Method	Testing Location
Air Testing									
Total Suspended Particulate *	10:00 AM - 10:48 AM	g/s	-	-	<0.004	-	0.019	Calculated	Rayong

Guideline :

Guideline (1) : Notification of the Ministry of Industry on determining pollutant contents in air emitted from electric power generation, transmission and distribution plant, 2004 (B.E. 2547), dated September, 2004 (B.E. 2547).
: Notification of the Ministry of Natural Resources and Environment, 2010 (B.E. 2553) on Emission Standard from New Power Plants.

Guideline (2) : Environmental Impact Assessment Report of Global Power Synergy Public Company Limited. (CUP 1)

Sampled By : Kantaphon Maneesampan , Pipat Nipatsed

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
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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 1 of 10

Sample Number 2397766-1
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location บังเกอร์ HRSG #3
Date Analysis Commenced Sep 28, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Ammonia	11:10 AM - 01:10 PM	ppm	-	0.10	<0.10	50	Based on Method of Air Sampling and Analysis, 401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 2 of 10

Sample Number 2397766-2
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location บังเกอร์ HRSG #4
Date Analysis Commenced Sep 28, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Ammonia	11:05 AM - 01:05 PM	ppm	-	0.10	<0.10	50	Based on Method of Air Sampling and Analysis, 401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 3 of 10

Sample Number 2397766-3
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location บังเกอร์ HRS #5
Date Analysis Commenced Sep 28, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Ammonia	11:00 AM - 01:00 PM	ppm	-	0.10	<0.10	50	Based on Method of Air Sampling and Analysis, 401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 4 of 10

Sample Number 2397766-4
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location บังเกอร์ HRS #6
Date Analysis Commenced Sep 28, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Ammonia	11:20 AM - 01:20 PM	ppm	-	0.10	<0.10	50	Based on Method of Air Sampling and Analysis, 401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 5 of 10

Sample Number 2397766-5
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location NH4OH Tank
Date Analysis Commenced Sep 28, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Ammonia	11:05 AM - 01:05 PM	ppm	-	0.10	<0.10	50	Based on Method of Air Sampling and Analysis, 401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 6 of 10

Sample Number 2397766-6
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location Cooling Tower#1
Date Analysis Commenced Oct 03, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Chlorine	10:45 AM - 12:45 PM	ppm	-	0.10	<0.10	1(C)	Based on OSHA, ID 101	MOL	Bangkok

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 7 of 10

Sample Number 2397766-7
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location Cooling Tower#2
Date Analysis Commenced Oct 03, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Chlorine	10:50 AM - 12:50 PM	ppm	-	0.10	<0.10	1(C)	Based on OSHA, ID 101	MOL	Bangkok

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 8 of 10

Sample Number 2397766-8
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location Cooling Tower#3
Date Analysis Commenced Oct 03, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Chlorine	10:55 AM - 12:55 PM	ppm	-	0.10	<0.10	1(C)	Based on OSHA, ID 101	MOL	Bangkok

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

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Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 9 of 10

Sample Number 2397766-9
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location Demin Plant#1
Date Analysis Commenced Sep 29, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Hydrogen chloride	11:15 AM - 01:15 PM	ppm	-	0.05	<0.05	5(C)	Based on OSHA, ID-174-SG	MOL	Bangkok
Sodium hydroxide as NaOH	11:15 AM - 01:15 PM	mg/m3	-	0.05	<0.05	2	NIOSH (1994), 7401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

Remark :

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Approved by

Orawan R.

Orawan Rakyong
Scientist (3)

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397766

Date Received : Sep 28, 2023

Date Reported : Oct 11, 2023

Report Number : 2751588-1

Page 10 of 10

Sample Number 2397766-10
Sampled Date Sep 27, 2023
Sample Description Air Quality
Location Demin Plant#2
Date Analysis Commenced Sep 29, 2023
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.0 °C

Analyte	Sampled Date/time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Hydrogen chloride	10:50 AM - 12:50 PM	ppm	-	0.05	<0.05	5(C)	Based on OSHA, ID-174-SG	MOL	Bangkok
Sodium hydroxide as NaOH	10:50 AM - 12:50 PM	mg/m3	-	0.05	<0.05	2	NIOSH (1994), 7401	MOL	Rayong

Guideline :

MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)

Sampled By : Supot Salamteh

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782439-1

Page 1 of 1

Sample Number 2397657-1
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 11 - Sep 12, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.0	83.6	61.5
11:00 AM - 12:00 PM	65.1	79.4	62.3
12:00 PM - 01:00 PM	65.4	84.5	61.7
01:00 PM - 02:00 PM	65.7	85.9	61.5
02:00 PM - 03:00 PM	66.9	89.8	62.2
03:00 PM - 04:00 PM	65.9	90.9	61.8
04:00 PM - 05:00 PM	66.8	81.4	63.2
05:00 PM - 06:00 PM	66.7	90.4	63.2
06:00 PM - 07:00 PM	66.9	91.4	63.4
07:00 PM - 08:00 PM	65.2	87.6	63.2
08:00 PM - 09:00 PM	64.6	80.3	63.1
09:00 PM - 10:00 PM	64.4	80.2	62.9
10:00 PM - 11:00 PM	64.2	82.2	62.8
11:00 PM - 12:00 AM	64.1	78.7	62.9
12:00 AM - 01:00 AM	63.8	76.4	62.8
01:00 AM - 02:00 AM	63.6	78.4	63.0
02:00 AM - 03:00 AM	63.9	75.7	62.8
03:00 AM - 04:00 AM	64.4	79.7	63.0
04:00 AM - 05:00 AM	64.5	77.2	63.2
05:00 AM - 06:00 AM	65.8	87.6	63.2
06:00 AM - 07:00 AM	68.9	88.2	63.5
07:00 AM - 08:00 AM	69.4	93.3	63.4
08:00 AM - 09:00 AM	66.2	91.0	62.3
09:00 AM - 10:00 AM	66.8	84.2	62.6

Leq Average 24 hrs. (dB(A)) 65.9
Lmax (dB(A)) 93.3
L90 (dB(A)) 62.9
Ldn (dB(A)) 71.7
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782440-1

Page 1 of 1

Sample Number 2397657-2
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 12 - Sep 13, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.8	84.7	62.5
11:00 AM - 12:00 PM	65.4	89.5	62.2
12:00 PM - 01:00 PM	65.3	80.6	61.8
01:00 PM - 02:00 PM	66.1	82.9	62.1
02:00 PM - 03:00 PM	66.2	82.7	62.4
03:00 PM - 04:00 PM	66.3	89.3	62.8
04:00 PM - 05:00 PM	66.3	85.1	63.2
05:00 PM - 06:00 PM	67.2	91.8	63.2
06:00 PM - 07:00 PM	66.7	88.8	63.2
07:00 PM - 08:00 PM	65.8	90.3	62.8
08:00 PM - 09:00 PM	65.1	81.5	62.6
09:00 PM - 10:00 PM	65.0	86.8	62.7
10:00 PM - 11:00 PM	64.2	81.9	62.3
11:00 PM - 12:00 AM	64.7	84.5	62.5
12:00 AM - 01:00 AM	63.9	78.2	62.3
01:00 AM - 02:00 AM	64.3	78.8	62.5
02:00 AM - 03:00 AM	64.4	79.4	62.7
03:00 AM - 04:00 AM	64.9	77.5	62.7
04:00 AM - 05:00 AM	64.5	84.2	62.5
05:00 AM - 06:00 AM	66.0	87.3	62.8
06:00 AM - 07:00 AM	68.8	92.8	62.9
07:00 AM - 08:00 AM	68.2	85.1	62.9
08:00 AM - 09:00 AM	67.9	95.0	62.5
09:00 AM - 10:00 AM	66.1	85.1	61.7

Leq Average 24 hrs. (dB(A)) 66.0
Lmax (dB(A)) 95.0
L90 (dB(A)) 62.5
Ldn (dB(A)) 71.9

Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782441-1

Page 1 of 1

Sample Number 2397657-3
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 13 - Sep 14, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	66.4	85.7	61.9
11:00 AM - 12:00 PM	66.2	86.3	61.9
12:00 PM - 01:00 PM	65.6	85.5	61.9
01:00 PM - 02:00 PM	65.9	82.4	61.7
02:00 PM - 03:00 PM	66.2	88.8	62.0
03:00 PM - 04:00 PM	67.0	91.4	61.8
04:00 PM - 05:00 PM	65.9	85.2	62.1
05:00 PM - 06:00 PM	68.1	92.2	63.0
06:00 PM - 07:00 PM	67.0	92.8	62.9
07:00 PM - 08:00 PM	66.0	88.7	62.7
08:00 PM - 09:00 PM	65.3	83.0	62.9
09:00 PM - 10:00 PM	65.3	80.3	62.8
10:00 PM - 11:00 PM	64.7	82.8	62.4
11:00 PM - 12:00 AM	64.5	83.9	62.3
12:00 AM - 01:00 AM	63.6	78.4	62.3
01:00 AM - 02:00 AM	64.2	81.2	62.5
02:00 AM - 03:00 AM	64.1	80.3	62.5
03:00 AM - 04:00 AM	64.6	80.0	62.4
04:00 AM - 05:00 AM	65.0	80.8	62.7
05:00 AM - 06:00 AM	66.4	89.4	62.9
06:00 AM - 07:00 AM	68.0	85.0	62.9
07:00 AM - 08:00 AM	68.3	85.6	62.9
08:00 AM - 09:00 AM	67.7	82.5	62.2
09:00 AM - 10:00 AM	66.3	82.6	61.4

Leq Average 24 hrs. (dB(A)) 66.1
Lmax (dB(A)) 92.8
L90 (dB(A)) 62.4
Ldn (dB(A)) 71.9
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782442-1

Page 1 of 1

Sample Number 2397657-4
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 14 - Sep 15, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	66.3	83.5	61.8
11:00 AM - 12:00 PM	66.4	85.5	62.4
12:00 PM - 01:00 PM	66.5	84.0	61.9
01:00 PM - 02:00 PM	67.3	85.9	62.7
02:00 PM - 03:00 PM	68.4	94.8	62.8
03:00 PM - 04:00 PM	66.6	89.6	62.1
04:00 PM - 05:00 PM	68.7	92.7	63.4
05:00 PM - 06:00 PM	68.1	85.9	63.8
06:00 PM - 07:00 PM	67.4	85.5	63.6
07:00 PM - 08:00 PM	66.3	85.0	63.3
08:00 PM - 09:00 PM	65.8	80.2	63.2
09:00 PM - 10:00 PM	64.7	76.6	63.0
10:00 PM - 11:00 PM	64.8	80.6	63.1
11:00 PM - 12:00 AM	65.4	81.5	63.1
12:00 AM - 01:00 AM	64.9	78.0	63.0
01:00 AM - 02:00 AM	65.0	81.9	63.0
02:00 AM - 03:00 AM	65.2	78.1	63.5
03:00 AM - 04:00 AM	66.0	81.2	64.1
04:00 AM - 05:00 AM	66.2	79.8	64.6
05:00 AM - 06:00 AM	66.6	80.5	64.6
06:00 AM - 07:00 AM	69.3	87.6	65.7
07:00 AM - 08:00 AM	70.7	97.9	63.8
08:00 AM - 09:00 AM	68.1	93.1	62.8
09:00 AM - 10:00 AM	67.6	83.3	62.8

Leq Average 24 hrs. (dB(A)) 67.0
Lmax (dB(A)) 97.9
L90 (dB(A)) 63.1
Ldn (dB(A)) 72.8

Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

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

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782443-1

Page 1 of 1

Sample Number 2397657-5
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 15 - Sep 16, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	68.4	92.7	63.8
11:00 AM - 12:00 PM	66.7	84.0	63.6
12:00 PM - 01:00 PM	67.7	86.9	63.4
01:00 PM - 02:00 PM	67.0	87.2	62.8
02:00 PM - 03:00 PM	67.3	85.1	62.8
03:00 PM - 04:00 PM	68.2	90.6	63.0
04:00 PM - 05:00 PM	67.2	91.4	63.9
05:00 PM - 06:00 PM	68.4	84.1	63.8
06:00 PM - 07:00 PM	67.3	91.4	63.3
07:00 PM - 08:00 PM	66.5	85.2	63.2
08:00 PM - 09:00 PM	66.4	85.1	63.2
09:00 PM - 10:00 PM	65.6	82.7	63.3
10:00 PM - 11:00 PM	65.6	88.4	62.9
11:00 PM - 12:00 AM	64.4	80.2	62.7
12:00 AM - 01:00 AM	64.4	78.2	62.8
01:00 AM - 02:00 AM	64.3	79.4	62.8
02:00 AM - 03:00 AM	64.2	79.6	62.8
03:00 AM - 04:00 AM	64.3	78.0	63.0
04:00 AM - 05:00 AM	64.9	80.7	63.1
05:00 AM - 06:00 AM	65.0	83.4	63.1
06:00 AM - 07:00 AM	67.1	84.3	63.3
07:00 AM - 08:00 AM	67.8	90.5	63.1
08:00 AM - 09:00 AM	66.4	84.8	62.4
09:00 AM - 10:00 AM	66.3	86.6	62.2

Leq Average 24 hrs. (dB(A)) 66.5
Lmax (dB(A)) 92.7
L90 (dB(A)) 63.1
Ldn (dB(A)) 71.8
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782444-1

Page 1 of 1

Sample Number 2397657-6
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 16 - Sep 17, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.9	87.5	62.6
11:00 AM - 12:00 PM	64.8	82.7	62.6
12:00 PM - 01:00 PM	64.9	85.7	62.6
01:00 PM - 02:00 PM	64.8	84.6	62.3
02:00 PM - 03:00 PM	64.7	82.8	62.0
03:00 PM - 04:00 PM	66.1	81.5	62.8
04:00 PM - 05:00 PM	65.8	82.8	63.0
05:00 PM - 06:00 PM	67.2	93.1	63.0
06:00 PM - 07:00 PM	66.7	89.6	63.6
07:00 PM - 08:00 PM	65.3	79.2	63.6
08:00 PM - 09:00 PM	64.5	77.6	63.4
09:00 PM - 10:00 PM	64.8	82.0	63.5
10:00 PM - 11:00 PM	64.5	80.1	63.5
11:00 PM - 12:00 AM	64.3	77.4	63.5
12:00 AM - 01:00 AM	64.1	75.5	63.3
01:00 AM - 02:00 AM	63.9	78.3	63.2
02:00 AM - 03:00 AM	64.1	78.6	63.2
03:00 AM - 04:00 AM	63.8	77.7	63.1
04:00 AM - 05:00 AM	64.3	82.9	63.3
05:00 AM - 06:00 AM	65.0	82.5	63.5
06:00 AM - 07:00 AM	66.7	89.0	63.6
07:00 AM - 08:00 AM	67.6	95.5	63.3
08:00 AM - 09:00 AM	66.2	85.6	63.1
09:00 AM - 10:00 AM	65.3	82.7	62.6

Leq Average 24 hrs. (dB(A)) 65.4
Lmax (dB(A)) 95.5
L90 (dB(A)) 63.2
Ldn (dB(A)) 71.2
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397657

Date Received : Sep 18, 2023
Date Reported : Sep 22, 2023
Report Number: 2782445-1

Page 1 of 1

Sample Number 2397657-7
Parameter Noise (Leq 24 hrs.)
Location ริมรั้วด้านทางเข้าโรงงาน (GPS 47P 0730817, 1405162)
Measurement Date Sep 17 - Sep 18, 2023
Measurement by Chatchai Sukpia
Sound Level meter Serial No. 734218

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.7	87.0	62.6
11:00 AM - 12:00 PM	65.4	85.4	62.6
12:00 PM - 01:00 PM	64.5	80.8	62.6
01:00 PM - 02:00 PM	64.5	80.7	62.6
02:00 PM - 03:00 PM	65.8	82.3	62.9
03:00 PM - 04:00 PM	64.8	80.3	62.8
04:00 PM - 05:00 PM	64.9	80.6	62.8
05:00 PM - 06:00 PM	64.8	81.8	62.9
06:00 PM - 07:00 PM	66.9	97.1	62.6
07:00 PM - 08:00 PM	65.0	85.4	62.6
08:00 PM - 09:00 PM	64.2	81.1	62.7
09:00 PM - 10:00 PM	64.3	78.6	62.9
10:00 PM - 11:00 PM	64.6	87.4	63.1
11:00 PM - 12:00 AM	64.0	81.9	63.1
12:00 AM - 01:00 AM	64.1	76.9	63.1
01:00 AM - 02:00 AM	63.5	79.7	62.6
02:00 AM - 03:00 AM	63.5	74.2	62.7
03:00 AM - 04:00 AM	63.7	77.4	62.6
04:00 AM - 05:00 AM	64.8	83.1	62.8
05:00 AM - 06:00 AM	65.2	81.2	62.7
06:00 AM - 07:00 AM	69.1	97.9	63.2
07:00 AM - 08:00 AM	68.5	89.1	63.4
08:00 AM - 09:00 AM	66.8	87.8	62.0
09:00 AM - 10:00 AM	65.6	82.4	61.8

Leq Average 24 hrs. (dB(A)) 65.4
Lmax (dB(A)) 97.9
L90 (dB(A)) 62.7
Ldn (dB(A)) 71.6
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

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

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795624-1

Page 1 of 1

Sample Number 2397777-1
Parameter Noise (Leq 8 hrs.)
Location เครื่องอัดอากาศ
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:01 AM - 09:01 AM	81.5	88.8	79.8
09:01 AM - 10:01 AM	81.6	87.6	80.1
10:01 AM - 11:01 AM	81.6	86.2	80.0
11:01 AM - 12:01 PM	81.5	88.8	79.8
12:01 PM - 01:01 PM	81.5	86.3	79.4
01:01 PM - 02:01 PM	81.5	86.9	79.6
02:01 PM - 03:01 PM	81.6	86.4	79.9
03:01 PM - 04:01 PM	81.3	85.6	79.9

Leq Average 8 hrs. (dB(A))

81.5

Lmax (dB(A))

88.8

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795625-1

Page 1 of 1

Sample Number 2397777-2
Parameter Noise (Leq 8 hrs.)
Location หอหล่อเย็น
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:01 AM - 09:01 AM	70.2	80.8	69.7
09:01 AM - 10:01 AM	70.2	77.7	69.6
10:01 AM - 11:01 AM	70.8	86.4	70.0
11:01 AM - 12:01 PM	70.5	86.0	69.6
12:01 PM - 01:01 PM	70.1	85.3	69.5
01:01 PM - 02:01 PM	70.3	77.7	69.7
02:01 PM - 03:01 PM	70.4	77.7	69.7
03:01 PM - 04:01 PM	70.2	77.7	69.6

Leq Average 8 hrs. (dB(A))

70.3

Lmax (dB(A))

86.4

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795626-1

Page 1 of 1

Sample Number 2397777-3
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #1
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:05 AM - 09:05 AM	75.9	78.0	75.5
09:05 AM - 10:05 AM	75.8	101.8	74.8
10:05 AM - 11:05 AM	75.4	80.1	75.1
11:05 AM - 12:05 PM	75.2	79.7	75.0
12:05 PM - 01:05 PM	75.2	81.5	75.0
01:05 PM - 02:05 PM	75.4	88.4	75.1
02:05 PM - 03:05 PM	76.4	80.8	75.3
03:05 PM - 04:05 PM	76.7	78.8	76.3

Leq Average 8 hrs. (dB(A))

75.8

Lmax (dB(A))

101.8

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795627-1

Page 1 of 1

Sample Number 2397777-4
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #2
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:34 PM - 09:34 PM	84.3	86.2	84.1
09:34 PM - 10:34 PM	84.2	87.4	84.0
10:34 PM - 11:34 PM	84.2	85.1	84.0
11:34 PM - 12:34 AM	84.2	85.6	84.0
12:34 AM - 01:34 AM	84.3	85.5	84.0
01:34 AM - 02:34 AM	84.2	85.1	84.0
02:34 AM - 03:34 AM	84.2	85.1	84.0
03:34 AM - 04:34 AM	84.2	85.4	83.9

Leq Average 8 hrs. (dB(A))

84.2

Lmax (dB(A))

87.4

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795628-1

Page 1 of 1

Sample Number 2397777-5
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #3
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:33 PM - 09:33 PM	82.7	87.8	82.4
09:33 PM - 10:33 PM	82.6	83.9	82.4
10:33 PM - 11:33 PM	82.6	84.8	82.3
11:33 PM - 12:33 AM	82.5	83.4	82.3
12:33 AM - 01:33 AM	82.6	83.9	82.3
01:33 AM - 02:33 AM	82.7	83.7	82.4
02:33 AM - 03:33 AM	82.7	84.1	82.4
03:33 AM - 04:33 AM	82.6	83.8	82.4

Leq Average 8 hrs. (dB(A))

82.6

Lmax (dB(A))

87.8

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795629-1

Page 1 of 1

Sample Number 2397777-6
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #4
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:00 AM - 09:00 AM	80.3	81.5	80.1
09:00 AM - 10:00 AM	80.8	84.8	78.2
10:00 AM - 11:00 AM	80.0	83.4	78.7
11:00 AM - 12:00 PM	80.2	81.4	80.0
12:00 PM - 01:00 PM	80.2	82.5	80.1
01:00 PM - 02:00 PM	80.1	85.0	80.0
02:00 PM - 03:00 PM	82.8	86.8	80.2
03:00 PM - 04:00 PM	84.0	87.1	83.4

Leq Average 8 hrs. (dB(A))

81.3

Lmax (dB(A))

87.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795630-1

Page 1 of 1

Sample Number 2397777-7
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #5
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:09 AM - 09:09 AM	81.9	84.8	81.8
09:09 AM - 10:09 AM	81.2	81.9	81.0
10:09 AM - 11:09 AM	81.3	86.3	81.1
11:09 AM - 12:09 PM	81.2	84.4	81.0
12:09 PM - 01:09 PM	81.1	81.9	81.0
01:09 PM - 02:09 PM	81.2	81.9	81.0
02:09 PM - 03:09 PM	81.5	82.6	81.1
03:09 PM - 04:09 PM	81.8	83.0	81.6

Leq Average 8 hrs. (dB(A))

81.4

Lmax (dB(A))

86.3

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795631-1

Page 1 of 1

Sample Number 2397777-8
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #6
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:36 PM - 09:36 PM	81.9	96.3	81.0
09:36 PM - 10:36 PM	81.6	88.1	81.0
10:36 PM - 11:36 PM	81.6	92.5	81.0
11:36 PM - 12:36 AM	81.5	86.6	81.0
12:36 AM - 01:36 AM	81.5	85.0	81.0
01:36 AM - 02:36 AM	81.8	85.3	81.1
02:36 AM - 03:36 AM	81.4	86.4	80.8
03:36 AM - 04:36 AM	81.5	84.7	81.1

Leq Average 8 hrs. (dB(A))

81.6

Lmax (dB(A))

96.3

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795632-1

Page 1 of 1

Sample Number 2397777-9
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #1
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:09 AM - 09:09 AM	79.6	94.3	78.9
09:09 AM - 10:09 AM	79.7	82.8	79.1
10:09 AM - 11:09 AM	79.4	94.1	78.7
11:09 AM - 12:09 PM	79.2	83.5	78.5
12:09 PM - 01:09 PM	79.5	82.4	78.7
01:09 PM - 02:09 PM	79.5	84.3	78.8
02:09 PM - 03:09 PM	80.0	84.9	79.2
03:09 PM - 04:09 PM	80.0	83.6	79.3

Leq Average 8 hrs. (dB(A))

79.6

Lmax (dB(A))

94.3

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795633-1

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Sample Number 2397777-10
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #2
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:28 PM - 09:28 PM	80.1	81.1	79.9
09:28 PM - 10:28 PM	80.1	81.1	79.9
10:28 PM - 11:28 PM	80.0	80.8	79.8
11:28 PM - 12:28 AM	80.0	80.9	79.8
12:28 AM - 01:28 AM	80.1	81.1	79.9
01:28 AM - 02:28 AM	80.1	81.1	79.9
02:28 AM - 03:28 AM	80.0	80.9	79.8
03:28 AM - 04:28 AM	80.0	80.9	79.8

Leq Average 8 hrs. (dB(A))

80.1

Lmax (dB(A))

81.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795634-1

Page 1 of 1

Sample Number 2397777-11
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #3
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:37 PM - 09:37 PM	80.9	81.6	80.8
09:37 PM - 10:37 PM	80.9	81.4	80.8
10:37 PM - 11:37 PM	80.8	81.5	80.7
11:37 PM - 12:37 AM	80.9	81.5	80.7
12:37 AM - 01:37 AM	80.9	82.1	80.8
01:37 AM - 02:37 AM	80.9	81.6	80.8
02:37 AM - 03:37 AM	80.9	81.4	80.7
03:37 AM - 04:37 AM	80.9	81.6	80.7

Leq Average 8 hrs. (dB(A))

80.9

Lmax (dB(A))

82.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023
Date Reported : Oct 03, 2023
Report Number: 2795635-1

Page 1 of 1

Sample Number 2397777-12
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #4
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:05 AM - 09:05 AM	77.6	79.1	77.4
09:05 AM - 10:05 AM	78.3	84.2	76.9
10:05 AM - 11:05 AM	78.1	88.9	77.3
11:05 AM - 12:05 PM	77.9	86.9	77.1
12:05 PM - 01:05 PM	77.2	78.7	77.0
01:05 PM - 02:05 PM	77.9	85.9	77.2
02:05 PM - 03:05 PM	79.8	89.4	77.5
03:05 PM - 04:05 PM	80.0	85.9	78.6

Leq Average 8 hrs. (dB(A))

78.5

Lmax (dB(A))

89.4

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795636-1

Page 1 of 1

Sample Number 2397777-13
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #5
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:04 AM - 09:04 AM	76.8	83.0	75.8
09:04 AM - 10:04 AM	76.7	77.6	76.5
10:04 AM - 11:04 AM	76.2	82.9	75.5
11:04 AM - 12:04 PM	76.7	82.9	75.7
12:04 PM - 01:04 PM	75.4	76.3	75.2
01:04 PM - 02:04 PM	76.2	83.8	75.2
02:04 PM - 03:04 PM	77.7	86.7	75.7
03:04 PM - 04:04 PM	80.9	96.8	76.1

Leq Average 8 hrs. (dB(A))

77.4

Lmax (dB(A))

96.8

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023

Date Reported : Oct 03, 2023

Report Number: 2795637-1

Page 1 of 1

Sample Number 2397777-14
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #6
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:34 PM - 09:34 PM	80.9	84.2	79.6
09:34 PM - 10:34 PM	81.0	84.2	79.8
10:34 PM - 11:34 PM	80.6	84.8	79.7
11:34 PM - 12:34 AM	80.7	85.8	79.7
12:34 AM - 01:34 AM	80.7	86.8	79.7
01:34 AM - 02:34 AM	81.3	84.2	80.0
02:34 AM - 03:34 AM	81.0	85.4	79.8
03:34 AM - 04:34 AM	81.1	89.2	79.9

Leq Average 8 hrs. (dB(A))

80.9

Lmax (dB(A))

89.2

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397777

Date Received : Sep 28, 2023
Date Reported : Oct 03, 2023
Report Number: 2795638-1

Page 1 of 1

Sample Number 2397777-15
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำสำรอง
Measurement Date Sep 27, 2023
Measurement by Kantaphon Maneesampan

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:32 PM - 09:32 PM	79.8	83.1	78.8
09:32 PM - 10:32 PM	79.8	83.3	78.7
10:32 PM - 11:32 PM	79.6	83.5	78.7
11:32 PM - 12:32 AM	79.6	83.5	78.7
12:32 AM - 01:32 AM	79.7	82.7	78.8
01:32 AM - 02:32 AM	79.6	82.7	78.8
02:32 AM - 03:32 AM	79.5	82.9	78.7
03:32 AM - 04:32 AM	79.5	82.5	78.7

Leq Average 8 hrs. (dB(A))

79.6

Lmax (dB(A))

83.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836568-1

Page 1 of 1

Sample Number 23116715-1
Parameter Noise (Leq 8 hrs.)
Location เครื่องอัดอากาศ
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:02 AM - 11:02 AM	80.4	86.8	77.9
11:02 AM - 12:02 PM	80.1	86.3	77.9
12:02 PM - 01:02 PM	81.0	91.6	78.0
01:02 PM - 02:02 PM	80.4	86.9	77.8
02:02 PM - 03:02 PM	80.1	87.8	77.8
03:02 PM - 04:02 PM	80.5	86.7	78.0
04:02 PM - 05:02 PM	80.6	87.5	77.5
05:02 PM - 06:02 PM	80.7	87.6	77.6

Leq Average 8 hrs. (dB(A))

80.5

Lmax (dB(A))

91.6

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836569-1

Page 1 of 1

Sample Number 23116715-2
Parameter Noise (Leq 8 hrs.)
Location นอห่อเย็น
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:29 PM - 09:29 PM	68.9	72.8	68.5
09:29 PM - 10:29 PM	69.2	76.0	68.6
10:29 PM - 11:29 PM	69.1	73.1	68.6
11:29 PM - 12:29 AM	68.9	75.7	68.5
12:29 AM - 01:29 AM	68.9	74.1	68.5
01:29 AM - 02:29 AM	69.0	73.4	68.5
02:29 AM - 03:29 AM	69.1	74.2	68.5
03:29 AM - 04:29 AM	69.0	75.6	68.5

Leq Average 8 hrs. (dB(A))

69.0

Lmax (dB(A))

76.0

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836570-1

Page 1 of 1

Sample Number 23116715-3
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #1
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:02 AM - 11:02 AM	76.9	79.0	76.2
11:02 AM - 12:02 PM	76.8	80.7	76.3
12:02 PM - 01:02 PM	76.9	97.9	75.8
01:02 PM - 02:02 PM	77.6	83.6	76.9
02:02 PM - 03:02 PM	77.8	80.3	77.2
03:02 PM - 04:02 PM	77.7	79.8	77.0
04:02 PM - 05:02 PM	77.7	80.9	77.2
05:02 PM - 06:02 PM	77.7	79.8	77.0

Leq Average 8 hrs. (dB(A))

77.4

Lmax (dB(A))

97.9

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836571-1

Page 1 of 1

Sample Number 23116715-4
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #2
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:31 PM - 09:31 PM	78.8	82.9	78.4
09:31 PM - 10:31 PM	78.8	82.8	78.4
10:31 PM - 11:31 PM	78.8	81.8	78.4
11:31 PM - 12:31 AM	79.0	81.8	78.4
12:31 AM - 01:31 AM	79.0	83.5	78.4
01:31 AM - 02:31 AM	78.8	80.9	78.4
02:31 AM - 03:31 AM	78.7	80.1	78.3
03:31 AM - 04:31 AM	78.7	80.5	78.3

Leq Average 8 hrs. (dB(A))

78.8

Lmax (dB(A))

83.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836572-1

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Sample Number 23116715-5
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #3
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:25 PM - 09:25 PM	78.1	81.9	77.9
09:25 PM - 10:25 PM	78.3	82.9	78.0
10:25 PM - 11:25 PM	78.3	80.8	78.1
11:25 PM - 12:25 AM	78.3	81.3	78.0
12:25 AM - 01:25 AM	78.3	83.3	78.1
01:25 AM - 02:25 AM	78.4	79.8	78.2
02:25 AM - 03:25 AM	78.4	79.6	78.1
03:25 AM - 04:25 AM	78.3	79.3	78.1

Leq Average 8 hrs. (dB(A))

78.3

Lmax (dB(A))

83.3

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836573-1

Page 1 of 1

Sample Number 23116715-6
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #4
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:26 PM - 09:26 PM	83.2	85.9	82.6
09:26 PM - 10:26 PM	83.4	86.3	82.7
10:26 PM - 11:26 PM	83.3	86.3	82.7
11:26 PM - 12:26 AM	83.4	87.2	82.7
12:26 AM - 01:26 AM	83.4	87.5	82.7
01:26 AM - 02:26 AM	83.2	85.5	82.6
02:26 AM - 03:26 AM	83.1	86.5	82.6
03:26 AM - 04:26 AM	83.2	86.1	82.5

Leq Average 8 hrs. (dB(A))

83.3

Lmax (dB(A))

87.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023
Date Reported : Nov 15, 2023
Report Number: 2836574-1

Page 1 of 1

Sample Number 23116715-7
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #5
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:22 PM - 09:22 PM	76.8	77.4	76.7
09:22 PM - 10:22 PM	77.0	77.5	76.8
10:22 PM - 11:22 PM	76.9	77.4	76.8
11:22 PM - 12:22 AM	76.9	77.4	76.8
12:22 AM - 01:22 AM	76.9	77.4	76.8
01:22 AM - 02:22 AM	76.9	77.5	76.8
02:22 AM - 03:22 AM	76.9	77.5	76.8
03:22 AM - 04:22 AM	76.9	77.5	76.8

Leq Average 8 hrs. (dB(A))

76.9

Lmax (dB(A))

77.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836575-1

Page 1 of 1

Sample Number 23116715-8
Parameter Noise (Leq 8 hrs.)
Location เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #6
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:01 AM - 11:01 AM	80.1	81.3	79.8
11:01 AM - 12:01 PM	80.4	82.5	80.0
12:01 PM - 01:01 PM	80.6	95.1	79.9
01:01 PM - 02:01 PM	80.9	86.2	80.5
02:01 PM - 03:01 PM	80.7	82.8	80.5
03:01 PM - 04:01 PM	80.8	84.0	80.5
04:01 PM - 05:01 PM	80.8	83.0	80.5
05:01 PM - 06:01 PM	80.9	83.1	80.6

Leq Average 8 hrs. (dB(A))

80.7

Lmax (dB(A))

95.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836576-1

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Sample Number 23116715-9
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #1
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:06 AM - 11:06 AM	78.8	80.8	78.3
11:06 AM - 12:06 PM	78.8	81.0	78.4
12:06 PM - 01:06 PM	79.2	91.6	78.3
01:06 PM - 02:06 PM	79.4	82.0	79.0
02:06 PM - 03:06 PM	79.2	80.2	78.9
03:06 PM - 04:06 PM	79.4	81.0	79.0
04:06 PM - 05:06 PM	79.4	81.3	78.9
05:06 PM - 06:06 PM	79.3	81.2	78.8

Leq Average 8 hrs. (dB(A))

79.2

Lmax (dB(A))

91.6

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836577-1

Page 1 of 1

Sample Number 23116715-10
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #2
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:33 PM - 09:33 PM	78.8	79.9	78.5
09:33 PM - 10:33 PM	78.7	79.7	78.5
10:33 PM - 11:33 PM	78.7	80.0	78.5
11:33 PM - 12:33 AM	78.7	79.6	78.5
12:33 AM - 01:33 AM	78.7	82.1	78.5
01:33 AM - 02:33 AM	78.7	80.1	78.4
02:33 AM - 03:33 AM	78.8	80.3	78.5
03:33 AM - 04:33 AM	78.7	79.6	78.4

Leq Average 8 hrs. (dB(A))

78.7

Lmax (dB(A))

82.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836578-1

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Sample Number 23116715-11
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #3
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:29 PM - 09:29 PM	77.8	78.9	77.6
09:29 PM - 10:29 PM	77.9	79.2	77.6
10:29 PM - 11:29 PM	77.8	79.0	77.6
11:29 PM - 12:29 AM	77.9	79.1	77.6
12:29 AM - 01:29 AM	78.0	79.1	77.7
01:29 AM - 02:29 AM	77.9	79.2	77.6
02:29 AM - 03:29 AM	77.9	79.2	77.7
03:29 AM - 04:29 AM	77.9	79.0	77.6

Leq Average 8 hrs. (dB(A))

77.9

Lmax (dB(A))

79.2

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836579-1

Page 1 of 1

Sample Number 23116715-12
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #4
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:29 PM - 09:29 PM	82.0	84.5	81.4
09:29 PM - 10:29 PM	82.0	84.2	81.5
10:29 PM - 11:29 PM	82.0	83.9	81.5
11:29 PM - 12:29 AM	81.9	83.9	81.4
12:29 AM - 01:29 AM	82.0	84.1	81.4
01:29 AM - 02:29 AM	82.1	84.3	81.4
02:29 AM - 03:29 AM	82.0	84.0	81.4
03:29 AM - 04:29 AM	81.8	84.3	81.2

Leq Average 8 hrs. (dB(A))

82.0

Lmax (dB(A))

84.5

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836580-1

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Sample Number 23116715-13
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #5
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
08:30 PM - 09:30 PM	70.7	71.7	70.4
09:30 PM - 10:30 PM	70.7	71.5	70.4
10:30 PM - 11:30 PM	70.5	71.4	70.1
11:30 PM - 12:30 AM	70.4	71.4	70.2
12:30 AM - 01:30 AM	70.5	71.3	70.3
01:30 AM - 02:30 AM	70.6	71.7	70.3
02:30 AM - 03:30 AM	70.4	71.2	70.1
03:30 AM - 04:30 AM	70.4	71.4	70.2

Leq Average 8 hrs. (dB(A))

70.5

Lmax (dB(A))

71.7

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836581-1

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Sample Number 23116715-14
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำหลัก HRSG #6
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:07 AM - 11:07 AM	77.7	78.6	77.4
11:07 AM - 12:07 PM	77.8	78.9	77.6
12:07 PM - 01:07 PM	78.1	95.1	77.6
01:07 PM - 02:07 PM	78.6	83.3	78.3
02:07 PM - 03:07 PM	78.4	79.5	78.2
03:07 PM - 04:07 PM	78.2	79.3	78.0
04:07 PM - 05:07 PM	78.1	79.0	77.9
05:07 PM - 06:07 PM	78.2	79.1	78.0

Leq Average 8 hrs. (dB(A))

78.1

Lmax (dB(A))

95.1

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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Project Name : Monitoring
Project Location : CUP 1

Lot ID: 23116715

Date Received : Nov 10, 2023

Date Reported : Nov 15, 2023

Report Number: 2836582-1

Page 1 of 1

Sample Number 23116715-15
Parameter Noise (Leq 8 hrs.)
Location หน่วยผลิตไอน้ำสำรอง
Measurement Date Nov 09, 2023
Measurement by Natthapon Jiengwareewong

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:04 AM - 11:04 AM	77.0	92.0	76.2
11:04 AM - 12:04 PM	76.6	79.3	75.7
12:04 PM - 01:04 PM	76.6	79.2	75.7
01:04 PM - 02:04 PM	76.6	97.3	75.3
02:04 PM - 03:04 PM	77.0	79.9	76.0
03:04 PM - 04:04 PM	77.2	79.4	76.4
04:04 PM - 05:04 PM	77.0	79.7	76.0
05:04 PM - 06:04 PM	77.2	79.9	76.4

Leq Average 8 hrs. (dB(A))

76.9

Lmax (dB(A))

97.3

Standard (dB(A))

90

140

Reference Method : ISO1996-1 and 1996-2

Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรการคุ้มครองความปลอดภัย
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TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2371822

Date Received : Jul 11, 2023

Date Reported : Jul 18, 2023

Report Number : 2692042-1

Page 1 of 1

Sample Number	2371822-1
Sampled Date	Jul 11, 2023 10:50 AM
Sample Description	Wastewater
Location	บ่อดักน้ำเสียจากน้ำทิ้งของโครงการ
Date Analysis Commenced	Jul 11, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Rayong
pH at 25 degree C *		-	-	7.8	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	32.1	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	242	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	23	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Sansoen Khuiyoksui ทะเบียนเลขที่ ว-323-จ-0005

Remark :

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- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

N. Banchongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2389213

Date Received : Aug 08, 2023

Date Reported : Aug 16, 2023

Report Number : 2732911-1

Page 1 of 1

Sample Number	2389213-1
Sampled Date	Aug 08, 2023 11:10 AM
Sample Description	Wastewater
Location	บ่อตรวจวัดคุณภาพน้ำทิ้งของโครงการ
Date Analysis Commenced	Aug 08, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Rayong
pH at 25 degree C *		-	-	8.2	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	31.5	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	260	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	60	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Paramet Sattayakun ทะเบียนเลขที่ ว-323-จ-9476

Remark :

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

N. Banchongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING
No.0042

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Lot ID: 2397793

Date Received : Sep 12, 2023

Date Reported : Sep 19, 2023

Report Number : 2751696-1

Page 1 of 1

Sample Number	2397793-1
Sampled Date	Sep 12, 2023 10:10 AM
Sample Description	Wastewater
Location	บ่อดักน้ำเสียจากน้ำทิ้งของโครงการ
Date Analysis Commenced	Sep 12, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, 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, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	32.3	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	360	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	5	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Chainusorn Lertnanthakunchai ทะเบียนเลขที่ ว-323-จ-9461

Remark :

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Technical Management

N. Banchongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING

No.0042

Lot ID: 23108333

Date Received : Oct 10, 2023

Date Reported : Oct 18, 2023

Report Number : 2777728-1

Client : Global Power Synergy Public Company Limited

92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

Page 1 of 1

Sample Number	23108333-1
Sampled Date	Oct 10, 2023 10:30 AM
Sample Description	Wastewater
Location	บ่อดักน้ำเสียจากน้ำทิ้งของโครงการ
Date Analysis Commenced	Oct 10, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Rayong
pH at 25 degree C *		-	-	7.8	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	31.4	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	260	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Chainusorn Lertnanthakunchai ทะเบียนเลขที่ ว-323-จ-9461

Remark :

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Technical Management

N. Banchongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

TESTING

No.0042

Lot ID: 23116717

Date Received : Nov 14, 2023

Date Reported : Nov 20, 2023

Report Number : 2797192-1

Client : Global Power Synergy Public Company Limited

92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location: CUP 1

Page 1 of 1

Sample Number	23116717-1
Sampled Date	Nov 14, 2023 11:05 AM
Sample Description	Wastewater
Location	บ่อดักน้ำเสียจากน้ำทิ้งของโครงการ
Date Analysis Commenced	Nov 14, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Rayong
pH at 25 degree C *		-	-	7.6	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	32.2	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1070	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	21	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Sansoen Khuiyoksui ทะเบียนเลขที่ ว-323-จ-0005

Remark :

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Technical Management

N. Banongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand 21150

P/O : DA41002956

Project Name : Monitoring

Project Location : CUP 1

TESTING

No.0042

Lot ID: 23131560

Date Received : Dec 12, 2023

Date Reported : Dec 19, 2023

Report Number : 2832220-1

Page 1 of 1

Sample Number	23131560-1
Sampled Date	Dec 12, 2023 10:45 AM
Sample Description	Wastewater
Location	บ่อดักน้ำทิ้งของโครงการ
Date Analysis Commenced	Dec 12, 2023
Condition of Sample	Contained in one amber glass bottle and two 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, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
Oil & Grease *	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 5520 B	Rayong
pH at 25 degree C *		-	-	7.8	5.5-9.0	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	30.6	≤45	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	584	≤3000	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	40	≤200	Standard Methods for the Examination of Water and Wastewater. APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Notification of the Industrial Estate Authority of Thailand No.76, B.E. 2560 : Criteria of wastewater characteristic from factory discharge to central wastewater Treatment Plant

Sampling By : Tanasit Wongsachai ทะเบียนเลขที่ ว-323-จ-9460

Remark :

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Technical Management

N. Banongkit

Narumon Banchongkit

Supervisor

ทะเบียนเลขที่ ว-323-จ-9445

Approved by

D. Changchon

Dej Changchon

Senior Manager

ทะเบียนเลขที่ ว-323-ค-9442

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

Page 1 of 13

Sample Number 2397778-1
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #1	120	27.4	26.1	30.3	29.9
Average (WBGT)		27.4			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778

Date Received : Sep 28, 2023

Date Reported : Oct 02, 2023

Report Number: 2751656-1

Page 2 of 13

Sample Number 2397778-2
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #2	120	27.1	25.9	29.8	29.5
Average (WBGT)		27.1			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

Page 3 of 13

Sample Number 2397778-3
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #3	120	27.6	26.3	30.6	30.2
Average (WBGT)		27.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778

Date Received : Sep 28, 2023

Date Reported : Oct 02, 2023

Report Number: 2751656-1

Page 4 of 13

Sample Number 2397778-4
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #4	120	27.4	26.1	30.4	30.1
Average (WBGT)		27.4			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

Page 5 of 13

Sample Number 2397778-5
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #5	120	28.9	26.9	33.5	33.2
Average (WBGT)		28.9			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

Approved by

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Global Power Synergy Public Company Limited
92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
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Sample Number 2397778-6
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
เครื่องกำเนิดไฟฟ้ากังหันก๊าซ #6	120	28.1	26.9	30.8	30.5
Average (WBGT)		28.1			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Section Head

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-7
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #1	120	29.2	27.5	33.4	32.8
Average (WBGT)		29.2			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-8
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #2	120	29.1	27.3	33.3	33.0
Average (WBGT)		29.1			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-9
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #3	120	28.1	26.8	31.5	30.6
Average (WBGT)		28.1			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-10
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #4	120	27.9	26.9	30.3	30.2
Average (WBGT)		27.9			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Technical Management

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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-11
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #5	120	28.8	27.4	32.3	31.9
Average (WBGT)		28.8			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778

Date Received : Sep 28, 2023

Date Reported : Oct 02, 2023

Report Number: 2751656-1

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Sample Number 2397778-12
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำหลัก HRSG #6	120	28.6	26.7	33.1	32.4
Average (WBGT)		28.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Analysis / Test Report

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92/9, Rayong Highway Road 3191, Map Ta Phut, Mueang, Rayong Thailand
21150
P/O : DA41002956
Project Name : Monitoring
Project Location : CUP 1

Lot ID: 2397778
Date Received : Sep 28, 2023
Date Reported : Oct 02, 2023
Report Number: 2751656-1

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Sample Number 2397778-13
Parameter Heat Stress (Sampling Time : 02.00 - 04.00 PM)
Measurement Date Sep 27, 2023
Measurement by Supot Salamteh
Location ปฏิบัติงาน 1 พื้นที่ (ชื่อ-นามสกุล ผู้ปฏิบัติงาน : - แผนก : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
หน่วยผลิตไอน้ำสำรอง	120	28.2	26.9	31.3	30.9
Average (WBGT)		28.2			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supot Salamteh
Section Head

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ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



Lot No. 2397705-1

ANALYZER CALIBRATION DATA

Client : Global Power Synergy PCL. Location : HRSBG #1
Date : 12 Sep 23 Test Operator : Sakait P.

O₂ ANALYZER
Model : TELEDYNE API 200EH Serial No. : 774
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.08
Low-Level Gas	7.93	7.90	7.92	0.08
Span Gas	16.00	15.97	15.99	0.08

NO_x ANALYZER
Model : TELEDYNE API 200EH Serial No. : 774
Span (ppm) : 200

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.06	-0.01	0.03
Low-Level Gas	82.39	82.33	82.38	0.02
Span Gas	164.40	164.34	164.39	0.02

CO ANALYZER
Model : TELEDYNE API 300EM Serial No. : 451
Span (ppm) : 500

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.00
Low-Level Gas	79.48	79.45	79.47	0.00
Span Gas	407.40	407.37	407.39	0.00

Calibrated by

(Mr. Sakait Phaisanphleut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397705-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Global Power Synergy PCL. Location : HRSBG #1
Date : 12 Sep 23 Test Operator : Sakait P.

O₂ ANALYZER
Cylinder Conc. (%) : 16.00 Span (%) : 25

	O ₂ Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	0.00	-0.01	0.08	0.08
Upscale Gas	15.97	15.97	0.00	15.99	0.08	0.08

NO_x ANALYZER
Cylinder Conc. (ppm) : 164.40 Span (ppm) : 200

	NO _x Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.06	-0.06	0.00	-0.01	0.03	0.03
Upscale Gas	164.34	164.34	0.00	164.39	0.02	0.02

CO ANALYZER
Cylinder Conc. (ppm) : 407.40 Span (ppm) : 500

	CO Analyzer Calibration Response	Initial Values System Calibration Response	System Cal Bias (% of Span)	Final Values System Calibration Response	System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	0.00	-0.01	0.00	0.00
Upscale Gas	407.37	407.37	0.00	407.39	0.00	0.00

Calibrated by

(Mr. Sakait Phaisanphleut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	1
Date	12 Sep 23	Location	HRSBG #1
Start Time	10:15	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	10:35
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:15	14.01	3.86	7.43	-	5.52	
10:16	14.03	3.85	7.58	-	5.64	
10:17	14.06	3.85	7.53	-	5.79	
10:18	14.12	3.79	7.44	-	6.19	
10:19	14.14	3.78	7.37	-	6.26	
10:20	14.14	3.77	7.28	-	6.26	
10:21	14.10	3.80	7.35	-	6.04	
10:22	14.05	3.82	7.43	-	5.74	
10:23	14.08	3.82	7.45	-	5.88	
10:24	14.07	3.82	7.51	-	6.06	
10:25	14.12	3.77	7.35	-	6.40	
10:26	14.14	3.77	7.38	-	6.33	
10:27	14.17	3.75	7.22	-	6.54	
10:28	14.13	3.77	7.25	-	6.23	
10:29	14.12	3.78	7.27	-	6.17	
10:30	14.08	3.82	7.38	-	5.96	
10:31	14.10	3.81	7.37	-	5.98	
10:32	14.10	3.79	7.37	-	5.97	
10:33	14.14	3.77	7.29	-	6.16	
10:34	14.14	3.78	7.22	-	6.29	
10:35	14.14	3.78	7.11	-	6.28	
Average	14.10	3.79	7.36	-	6.08	

(Mr. Sakait Phaisanphleut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	2
Date	12 Sep 23	Location	HRSBG #1
Start Time	10:38	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	10:58
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:38	14.16	3.76	7.11	-	6.42	
10:39	14.17	3.76	7.10	-	6.57	
10:38	14.17	3.75	7.08	-	6.43	
10:39	14.13	3.77	7.10	-	6.16	
10:40	14.11	3.78	7.13	-	6.25	
10:41	14.10	3.78	7.09	-	6.20	
10:42	14.09	3.80	7.14	-	5.92	
10:43	14.14	3.78	7.16	-	6.38	
10:44	14.17	3.76	7.09	-	6.59	
10:45	14.24	3.73	6.84	-	7.06	
10:46	14.26	3.71	6.79	-	7.35	
10:47	14.28	3.70	6.69	-	7.30	
10:48	14.28	3.69	6.69	-	7.34	
10:49	14.28	3.68	6.67	-	7.51	
10:50	14.24	3.69	6.66	-	7.36	
10:51	14.26	3.71	6.64	-	7.32	
10:52	14.25	3.71	6.66	-	7.17	
10:53	14.22	3.73	6.65	-	7.03	
10:54	14.16	3.75	6.84	-	6.56	
10:55	14.14	3.77	6.88	-	6.32	
10:56	14.21	3.75	6.88	-	6.82	
Average	14.19	3.74	6.89	-	6.78	

(Mr. Sakait Phaisanphleut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	3
Date	12 Sep 23	Location	HRSG #1
Start Time	10:57	Test Operator	Sakalt P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	11:17
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EH	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:57	14.26	3.72	6.79	-	7.10	
10:58	14.30	3.69	6.67	-	7.38	
10:59	14.31	3.67	6.61	-	7.52	
11:00	14.29	3.67	6.66	-	7.49	
11:01	14.28	3.69	6.61	-	7.40	
11:02	14.20	3.74	6.73	-	7.00	
11:03	14.16	3.77	6.85	-	6.55	
11:04	14.14	3.78	6.84	-	6.34	
11:05	14.16	3.77	6.91	-	6.29	
11:06	14.18	3.73	6.88	-	6.66	
11:07	14.24	3.70	6.84	-	7.09	
11:08	14.33	3.67	6.66	-	7.59	
11:09	14.30	3.68	6.56	-	7.47	
11:10	14.31	3.69	6.56	-	7.58	
11:11	14.26	3.70	6.71	-	7.20	
11:12	14.26	3.70	6.69	-	7.21	
11:13	14.20	3.75	6.72	-	6.88	
11:14	14.23	3.75	6.74	-	6.79	
11:15	14.23	3.72	6.80	-	6.87	
11:16	14.28	3.68	6.69	-	7.29	
11:17	14.28	3.69	6.74	-	7.09	
Average	14.25	3.71	6.72	-	7.09	

Sakalt P.

(Mr.Sakalt Phalsanphaut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397706-1

ANALYZER CALIBRATION DATA

Client	Global Power Synergy PCL.	Location	HRSG #2
Date	13 Sep 23	Test Operator	Sakalt P.

O ₂ ANALYZER		Serial No.	774
Model	TELEDYNE API 200EH		
Span (%)	25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.08
Low-Level Gas	7.93	7.90	7.92	0.08
Span Gas	16.00	15.97	15.99	0.08

NO _x ANALYZER		Serial No.	774
Model	TELEDYNE API 200EH		
Span (ppm)	200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.07	-0.01	0.03
Low-Level Gas	82.39	82.32	82.38	0.03
Span Gas	164.40	164.33	164.39	0.03

CO ANALYZER		Serial No.	451
Model	TELEDYNE API 300EH		
Span (ppm)	500		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

Calibrated by

Sakalt P.

(Mr.Sakalt Phalsanphaut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397706-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Global Power Synergy PCL.	Location	HRSG #2
Date	13 Sep 23	Test Operator	Sakalt P.

O ₂ ANALYZER		Span (%)	25
Cylinder Conc. (%)	16.00		

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.08	0.08
Upscale Gas	15.97	15.97	0.00	15.99	0.08	0.08

NO _x ANALYZER		Span (ppm)	200
Cylinder Conc. (ppm)	164.40		

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.07	-0.07	0.00	-0.01	0.03	0.03
Upscale Gas	164.33	164.33	0.00	164.39	0.03	0.03

CO ANALYZER		Span (ppm)	500
Cylinder Conc. (ppm)	407.40		

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.04	-0.04	0.00	-0.01	0.01	0.01
Upscale Gas	407.36	407.36	0.00	407.39	0.01	0.01

Calibrated by

Sakalt P.

(Mr.Sakalt Phalsanphaut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	1
Date	13 Sep 23	Location	HRSG #2
Start Time	10:10	Test Operator	Sakalt P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	10:30
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EH	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:10	13.59	4.11	11.82	-	4.80	
10:11	13.58	4.12	11.91	-	4.68	
10:12	13.60	4.11	11.89	-	4.84	
10:13	13.63	4.09	11.85	-	4.79	
10:14	13.67	4.07	11.72	-	4.97	
10:15	13.69	4.06	11.50	-	5.11	
10:16	13.71	4.04	11.34	-	5.40	
10:17	13.69	4.05	11.33	-	5.15	
10:18	13.67	4.06	11.37	-	5.06	
10:19	13.66	4.07	11.41	-	5.07	
10:20	13.65	4.07	11.45	-	4.99	
10:21	13.61	4.10	11.51	-	4.97	
10:22	13.64	4.10	11.53	-	5.05	
10:23	13.73	4.04	11.41	-	5.52	
10:24	13.80	4.00	11.23	-	6.01	
10:25	13.86	3.95	10.99	-	6.58	
10:26	13.87	3.94	10.77	-	6.72	
10:27	13.85	3.95	10.77	-	6.49	
10:28	13.82	3.97	10.83	-	6.22	
10:29	13.72	4.02	11.07	-	5.63	
10:30	13.67	4.06	11.19	-	5.38	
Average	13.70	4.04	11.36	-	5.40	

Sakalt P.

(Mr.Sakalt Phalsanphaut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	2
Date		13 Sep 23	Location	HRSG #2
Start Time		10:31	Test Operator	Sakait P.
SO ₂ Analyzer Model		TELEDYNE API 100EH	Finish Time	10:51
NO _x /O ₂ Analyzer Model		TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model		TELEDYNE API 300EH	Serial No.	774
			Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:31	13.66	4.07	11.27	-	5.34	
10:32	13.71	4.05	11.16	-	5.51	
10:33	13.77	4.03	11.09	-	5.87	
10:34	13.82	3.99	10.85	-	5.24	
10:35	13.84	3.95	10.70	-	6.55	
10:36	13.78	3.98	10.66	-	6.12	
10:37	13.72	4.02	10.81	-	5.65	
10:38	13.71	4.03	10.96	-	5.45	
10:39	13.65	4.06	11.07	-	5.02	
10:40	13.60	4.09	11.23	-	4.89	
10:41	13.62	4.09	11.35	-	4.94	
10:42	13.68	4.05	11.38	-	5.18	
10:43	13.77	4.00	11.16	-	5.73	
10:44	13.79	4.00	11.01	-	5.81	
10:45	13.77	3.99	10.92	-	5.77	
10:46	13.76	3.99	10.93	-	5.64	
10:47	13.71	4.02	10.98	-	5.38	
10:48	13.70	4.04	11.05	-	5.21	
10:49	13.67	4.05	11.17	-	5.16	
10:50	13.66	4.06	11.32	-	5.06	
10:51	13.66	4.07	11.42	-	5.11	
Average	13.72	4.03	11.07	-	5.51	

Sakait P.

(Mr.Sakait Phaisanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL	Run #	3
Date		13 Sep 23	Location	HRSG #2
Start Time		10:52	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	11:12	
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437	
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774	
		Serial No.	451	

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:52	13.67	4.07	11.38	-	5.10	
10:53	13.70	4.04	11.27	-	5.25	
10:54	13.74	4.03	11.10	-	5.65	
10:55	13.70	4.03	11.08	-	5.44	
10:56	13.66	4.06	11.11	-	5.12	
10:57	13.66	4.06	11.26	-	4.96	
10:58	13.69	4.06	11.30	-	5.04	
10:59	13.73	4.04	11.28	-	5.16	
11:00	13.74	4.02	11.20	-	5.29	
11:01	13.77	4.01	11.13	-	5.63	
11:02	13.80	3.98	11.01	-	5.08	
11:03	13.75	4.00	10.98	-	5.68	
11:04	13.68	4.03	11.03	-	5.32	
11:05	13.65	4.06	11.22	-	5.06	
11:06	13.66	4.07	11.35	-	5.11	
11:07	13.65	4.08	11.39	-	4.96	
11:08	13.63	4.08	11.37	-	4.94	
11:09	13.68	4.06	11.34	-	5.08	
11:10	13.69	4.04	11.25	-	5.21	
11:11	13.67	4.06	11.20	-	5.18	
11:12	13.65	4.07	11.19	-	4.96	
Average	13.69	4.04	11.21	-	5.24	

Sakait P.

(Mr.Sakait Phaisanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397747-1

ANALYZER CALIBRATION DATA

Client	: Global Power Synergy PCL.	Location	: HRSG # 3
Date	: 13 Sep 23	Test Operator	: Sakait P.

O ₂ ANALYZER			
Model	: TELEDYNE API 200EH	Serial No.	: 774
Span (%)	: 25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.08
Low-Level Gas	7.93	7.90	7.92	0.08
Span Gas	16.00	15.97	15.99	0.08

NO _x ANALYZER			
Model	: TELEDYNE API 200EH	Serial No.	: 774
Span (ppm)	: 200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.07	-0.01	0.03
Low-Level Gas	82.39	82.32	82.38	0.03
Span Gas	164.40	164.33	164.39	0.03

CO ANALYZER			
Model	: TELEDYNE API 300EM	Serial No.	: 451
Span (ppm)	: 600		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

Calibrated by

Sakait P.

(Mr.Sakait Phaisanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397747-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	: Global Power Synergy PCL.	Location	: HRSG # 3
Date	: 13 Sep 23	Test Operator	: Sakait P.

O ₂ ANALYZER			
Cylinder Conc. (%)	: 16.00	Span (%)	: 25

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.08	0.08
Upscale Gas	15.97	15.97	0.00	15.99	0.08	0.08

NO _x ANALYZER			
Cylinder Conc. (ppm)	: 164.40	Span (ppm)	: 200

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.07	-0.07	0.00	-0.01	0.03	0.03
Upscale Gas	164.33	164.33	0.00	164.39	0.03	0.03

CO ANALYZER			
Cylinder Conc. (ppm)	: 407.40	Span (ppm)	: 600

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.04	-0.04	0.00	-0.01	0.01	0.01
Upscale Gas	407.36	407.36	0.00	407.39	0.01	0.01

Calibrated by

Sakait P.

(Mr.Sakait Phaisanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	1
Global Power Synergy PCL.		Location	HRSG # 3
Date	13 Sep 23	Test Operator	Sekait P.
Start Time	12:15	Finish Time	12:35
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:15	14.15	3.79	11.09	-	9.72	
12:16	14.14	3.78	11.05	-	9.82	
12:17	14.15	3.79	11.10	-	9.69	
12:18	14.17	3.78	11.24	-	9.69	
12:19	14.16	3.78	11.26	-	9.75	
12:20	14.13	3.76	11.23	-	9.76	
12:21	14.13	3.84	11.24	-	9.84	
12:22	14.12	3.79	11.22	-	9.69	
12:23	14.13	3.81	11.22	-	9.61	
12:24	14.10	3.82	11.15	-	9.61	
12:25	14.13	3.81	11.19	-	9.55	
12:26	14.13	3.81	11.17	-	9.55	
12:27	14.15	3.79	11.15	-	9.68	
12:28	14.14	3.79	11.18	-	9.74	
12:29	14.14	3.79	11.20	-	9.84	
12:30	14.11	3.81	11.12	-	9.96	
12:31	14.12	3.81	11.09	-	9.77	
12:32	14.11	3.80	11.13	-	9.77	
12:33	14.12	3.80	11.15	-	9.78	
12:34	14.11	3.80	11.13	-	9.73	
12:35	14.11	3.80	11.10	-	9.79	
Average	14.13	3.79	11.16	-	9.73	

Sekait P.

(Mr.Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO. : F 06-062 REVISION NO. : 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	2
Global Power Synergy PCL.		Location	HRSG # 3
Date	13 Sep 23	Test Operator	Sekait P.
Start Time	12:38	Finish Time	12:58
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:36	14.12	3.80	11.08	-	9.88	
12:37	14.10	3.81	11.05	-	9.73	
12:38	14.11	3.81	11.01	-	9.79	
12:39	14.09	3.80	10.98	-	9.91	
12:40	14.12	3.80	11.05	-	9.80	
12:41	14.11	3.81	11.18	-	9.82	
12:42	14.10	3.81	11.17	-	9.78	
12:43	14.07	3.82	11.12	-	9.68	
12:44	14.10	3.81	11.11	-	9.63	
12:45	14.10	3.81	11.11	-	9.77	
12:46	14.10	3.81	11.10	-	9.85	
12:47	14.11	3.81	11.10	-	9.79	
12:48	14.12	3.80	11.25	-	9.70	
12:49	14.12	3.80	11.26	-	9.77	
12:50	14.11	3.80	11.29	-	9.80	
12:51	14.12	3.79	11.27	-	9.82	
12:52	14.11	3.81	11.32	-	9.84	
12:53	14.10	3.80	11.35	-	9.82	
12:54	14.07	3.81	11.38	-	9.77	
12:55	14.10	3.80	11.35	-	9.81	
12:56	14.11	3.79	11.32	-	9.76	
Average	14.10	3.80	11.18	-	9.79	

Sekait P.

(Mr.Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO. : F 06-062 REVISION NO. : 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	3
Global Power Synergy PCL.		Location	HRSG # 3
Date	13 Sep 23	Test Operator	Sekait P.
Start Time	12:57	Finish Time	13:17
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:57	14.12	3.80	11.38	-	9.75	
12:58	14.11	3.80	11.43	-	9.70	
12:59	14.10	3.81	11.45	-	9.86	
13:00	14.11	3.81	11.39	-	9.93	
13:01	14.11	3.81	11.32	-	9.78	
13:02	14.10	3.81	11.27	-	9.75	
13:03	14.10	3.81	11.32	-	9.84	
13:04	14.09	3.81	11.30	-	9.72	
13:05	14.11	3.80	11.36	-	9.70	
13:06	14.12	3.79	11.46	-	9.73	
13:07	14.12	3.78	11.45	-	9.74	
13:08	14.09	3.81	11.44	-	9.83	
13:09	14.10	3.81	11.42	-	9.84	
13:10	14.09	3.81	11.50	-	9.79	
13:11	14.10	3.80	11.56	-	9.83	
13:12	14.11	3.79	11.57	-	9.73	
13:13	14.11	3.80	11.44	-	9.67	
13:14	14.09	3.81	11.40	-	9.59	
13:15	14.15	3.81	11.33	-	9.58	
13:16	14.13	3.79	11.36	-	9.65	
13:17	14.12	3.79	11.42	-	9.82	
Average	14.11	3.80	11.41	-	9.74	

Sekait P.

(Mr.Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO. : F 06-062 REVISION NO. : 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397748-1

ANALYZER CALIBRATION DATA

Client	: Global Power Synergy PCL.	Location	: HRSG #4
Date	: 15 Sep 23	Test Operator	: Sekait P.

O ₂ ANALYZER		Serial No.	: 774
Model	: TELEDYNE API 200EH		
Span (%)	: 25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.02	-0.01	0.04
Low-Level Gas	7.93	7.91	7.92	0.04
Span Gas	16.00	15.98	15.99	0.04

NO _x ANALYZER		Serial No.	: 774
Model	: TELEDYNE API 200EH		
Span (ppm)	: 200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.01
Low-Level Gas	82.39	82.36	82.38	0.01
Span Gas	164.40	164.37	164.39	0.01

CO ANALYZER		Serial No.	: 451
Model	: TELEDYNE API 300EM		
Span (ppm)	: 600		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

Calibrated by

Sekait P.

(Mr.Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO. : F 06-062 REVISION NO. : 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397748-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Global Power Synergy PCL. Location : HRSG #4
Date : 15 Sep 23 Test Operator : Sakalt P.

O₂ ANALYZER : 16.00 Span (%) : 25
Cylinder Conc. (%)

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.02	-0.02	0.00	-0.01	0.04	0.04
Upscale Gas	15.98	15.98	0.00	15.99	0.04	0.04

NO_x ANALYZER : 164.40 Span (ppm) : 200
Cylinder Conc. (ppm)

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.01	0.01
Upscale Gas	164.37	164.37	0.00	164.39	0.01	0.01

CO ANALYZER : 407.40 Span (ppm) : 500
Cylinder Conc. (ppm)

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.04	-0.04	0.00	-0.01	0.01	0.01
Upscale Gas	407.36	407.36	0.00	407.39	0.01	0.01

Calibrated by

(Mr. Sakalt Phaisanphituit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	1
Date	15 Sep 23	Location	HRSG #4
Start Time	11:55	Test Operator	Sakalt P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:15
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:55	13.78	4.01	6.89	-	5.93	
11:56	13.74	4.04	6.59	-	5.49	
11:57	13.71	4.06	6.44	-	5.22	
11:58	13.75	4.05	6.30	-	5.62	
11:59	13.79	4.00	6.16	-	5.81	
12:00	13.73	4.04	6.19	-	5.58	
12:01	13.74	4.06	6.26	-	5.39	
12:02	13.74	4.05	6.28	-	5.59	
12:03	13.75	4.06	6.15	-	5.67	
12:04	13.74	4.04	6.14	-	5.58	
12:05	13.68	4.08	6.27	-	5.13	
12:06	13.67	4.09	6.28	-	5.02	
12:07	13.71	4.06	6.19	-	5.32	
12:08	13.76	4.03	6.18	-	5.90	
12:09	13.80	4.00	6.28	-	6.28	
12:10	13.78	4.00	6.35	-	6.27	
12:11	13.77	4.01	6.43	-	5.75	
12:12	13.69	4.07	6.55	-	5.33	
12:13	13.67	4.10	6.56	-	5.07	
12:14	13.68	4.08	6.58	-	5.02	
12:15	13.75	4.03	6.95	-	5.48	
Average	13.73	4.04	6.38	-	5.65	

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ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	2
Date	15 Sep 23	Location	HRSG #4
Start Time	12:16	Test Operator	Sakalt P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:38
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:16	13.77	4.01	7.31	-	5.92	
12:17	13.75	4.01	7.41	-	5.88	
12:18	13.75	4.03	7.28	-	5.38	
12:19	13.69	4.05	7.03	-	5.19	
12:20	13.67	4.08	6.90	-	4.99	
12:21	13.65	4.09	6.62	-	4.85	
12:22	13.68	4.07	6.47	-	5.06	
12:23	13.75	4.01	6.45	-	5.43	
12:24	13.69	4.04	6.84	-	5.11	
12:25	13.74	4.05	7.03	-	5.44	
12:26	13.76	4.02	6.93	-	5.69	
12:27	13.80	4.00	6.63	-	5.90	
12:28	13.73	4.03	6.30	-	5.48	
12:29	13.73	4.04	6.13	-	5.22	
12:30	13.76	4.03	6.15	-	5.64	
12:31	13.82	4.01	6.32	-	6.03	
12:32	13.82	3.96	6.47	-	6.36	
12:33	13.78	3.99	6.69	-	5.81	
12:34	13.73	4.03	6.87	-	5.34	
12:35	13.75	4.03	7.02	-	5.24	
12:36	13.71	4.05	6.95	-	5.11	
Average	13.73	4.03	6.75	-	5.48	

(Mr. Sakalt Phaisanphituit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	3
Date	15 Sep 23	Location	HRSG #4
Start Time	12:37	Test Operator	Sakalt P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	12:57
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:37	13.74	4.04	6.71	-	5.19	
12:38	13.73	4.05	6.45	-	5.29	
12:39	13.80	4.01	6.29	-	5.94	
12:40	13.83	3.97	6.41	-	5.97	
12:41	13.73	4.04	6.80	-	5.15	
12:42	13.66	4.07	7.18	-	4.87	
12:43	13.70	4.06	7.35	-	4.95	
12:44	13.75	4.01	7.05	-	5.28	
12:45	13.71	4.04	6.50	-	5.10	
12:46	13.71	4.06	6.13	-	4.96	
12:47	13.76	4.04	6.00	-	5.32	
12:48	13.77	4.02	5.93	-	5.60	
12:49	13.75	4.02	5.86	-	5.18	
12:50	13.70	4.05	5.89	-	4.92	
12:51	13.76	4.03	5.98	-	5.29	
12:52	13.80	4.00	6.16	-	5.72	
12:53	13.75	4.03	6.26	-	5.44	
12:54	13.78	3.99	6.44	-	5.47	
12:55	13.76	4.02	6.50	-	5.34	
12:56	13.79	4.01	6.56	-	5.75	
12:57	13.74	4.03	6.71	-	5.34	
Average	13.74	4.02	6.44	-	5.34	

(Mr. Sakalt Phaisanphituit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397749-1

ANALYZER CALIBRATION DATA

Client : Global Power Synergy PCL. Location : HRS# 5
Date : 15 Sep 23 Test Operator : Sakait P.

O₂ ANALYZER
Model : TELEDYNE API 200EH Serial No. : 774
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.02	-0.01	0.04
Low-Level Gas	7.93	7.91	7.92	0.04
Span Gas	16.00	15.98	15.99	0.04

NO₂ ANALYZER
Model : TELEDYNE API 200EH Serial No. : 774
Span (ppm) : 200

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.01
Low-Level Gas	82.39	82.36	82.38	0.01
Span Gas	164.40	164.37	164.39	0.01

CO ANALYZER
Model : TELEDYNE API 300EM Serial No. : 451
Span (ppm) : 500

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

Calibrated by

(Mr. Sakait Phaisanphlout)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397749-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Global Power Synergy PCL. Location : HRS# 5
Date : 15 Sep 23 Test Operator : Sakait P.

O₂ ANALYZER
Cylinder Conc. (%) : 16.00 Span (%) : 25

	O ₂ Analyzer Calibration Response	Initial Values System Calibration Response System Cal Bias (% of Span)	Final Values System Calibration Response System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.02	-0.02	-0.01	0.04
Upscale Gas	15.98	15.98	15.99	0.04

NO₂ ANALYZER
Cylinder Conc. (ppm) : 164.40 Span (ppm) : 200

	NO ₂ Analyzer Calibration Response	Initial Values System Calibration Response System Cal Bias (% of Span)	Final Values System Calibration Response System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.03	-0.03	-0.01	0.01
Upscale Gas	164.37	164.37	164.39	0.01

CO ANALYZER
Cylinder Conc. (ppm) : 407.40 Span (ppm) : 500

	CO Analyzer Calibration Response	Initial Values System Calibration Response System Cal Bias (% of Span)	Final Values System Calibration Response System Cal Bias (% of Span)	Drift (% of Span)
Zero Gas	-0.04	-0.04	-0.01	0.01
Upscale Gas	407.36	407.36	407.39	0.01

Calibrated by

(Mr. Sakait Phaisanphlout)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	1
Date	15 Sep 23	Location	HRS# 5
Start Time	13:20	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	13:40
NO ₂ /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
13:20	13.74	4.05	2.25	-	13.66	
13:21	13.74	4.04	2.29	-	13.32	
13:22	13.70	4.05	2.28	-	14.00	
13:23	13.68	4.06	2.30	-	14.50	
13:24	13.67	4.07	2.28	-	14.49	
13:25	13.72	4.05	2.28	-	13.68	
13:26	13.74	4.04	2.28	-	13.18	
13:27	13.73	4.05	2.30	-	12.85	
13:28	13.76	4.04	2.26	-	12.42	
13:29	13.75	4.02	2.28	-	12.81	
13:30	13.66	4.09	2.27	-	15.97	
13:31	13.58	4.13	2.28	-	19.03	
13:32	13.57	4.13	2.24	-	19.35	
13:33	13.59	4.11	2.22	-	18.16	
13:34	13.64	4.09	2.20	-	16.21	
13:35	13.71	4.05	2.19	-	13.97	
13:36	13.74	4.03	2.19	-	12.43	
13:37	13.76	4.02	2.22	-	11.89	
13:38	13.73	4.02	2.25	-	12.85	
13:39	13.69	4.05	2.26	-	14.16	
13:40	13.65	4.09	2.23	-	15.57	
Average	13.69	4.06	2.25	-	14.50	

(Mr. Sakait Phaisanphlout)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client	Global Power Synergy PCL.	Run #	2
Date	15 Sep 23	Location	HRS# 5
Start Time	13:41	Test Operator	Sakait P.
SO ₂ Analyzer Model	TELEDYNE API 100EH	Finish Time	14:01
NO ₂ /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model	TELEDYNE API 300EM	Serial No.	774
		Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
13:41	13.64	4.09	2.23	-	16.02	
13:42	13.64	4.10	2.23	-	15.88	
13:43	13.67	4.10	2.25	-	14.88	
13:44	13.73	4.05	2.22	-	13.15	
13:45	13.77	4.01	2.24	-	11.64	
13:46	13.78	4.00	2.25	-	11.65	
13:47	13.72	4.04	2.29	-	12.68	
13:48	13.73	4.05	2.28	-	13.12	
13:49	13.69	4.07	2.27	-	14.19	
13:50	13.66	4.08	2.23	-	15.29	
13:51	13.69	4.07	2.24	-	15.12	
13:52	13.69	4.06	2.25	-	14.41	
13:53	13.73	4.05	2.26	-	13.89	
13:54	13.70	4.05	2.26	-	14.32	
13:55	13.70	4.06	2.22	-	14.32	
13:56	13.72	4.04	2.21	-	13.46	
13:57	13.72	4.04	2.21	-	12.90	
13:58	13.71	4.04	2.25	-	12.75	
13:59	13.75	4.02	2.29	-	11.93	
14:00	13.80	4.00	2.30	-	11.28	
14:01	13.79	4.00	2.32	-	11.41	
Average	13.71	4.04	2.25	-	13.54	

(Mr. Sakait Phaisanphlout)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	3
Date		15 Sep 23	Location	HRSG # 5
Start Time		14:02	Test Operator	Sakalt P.
SO ₂ Analyzer Model		TELEDYNE API 100EH	Finish Time	14:22
NO _x /O ₂ Analyzer Model		TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model		TELEDYNE API 300EH	Serial No.	774
			Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
14:02	13.77	4.01	2.34	-	12.04	
14:03	13.73	4.03	2.32	-	12.78	
14:04	13.71	4.05	2.29	-	13.25	
14:05	13.71	4.06	2.31	-	14.06	
14:06	13.66	4.08	2.29	-	15.01	
14:07	13.69	4.08	2.24	-	14.55	
14:08	13.76	4.02	2.25	-	12.90	
14:09	13.76	4.02	2.25	-	12.23	
14:10	13.78	4.01	2.25	-	11.98	
14:11	13.76	4.02	2.27	-	12.34	
14:12	13.76	4.03	2.27	-	12.18	
14:13	13.75	4.03	2.29	-	12.28	
14:14	13.73	4.03	2.32	-	12.85	
14:15	13.69	4.05	2.34	-	13.83	
14:16	13.69	4.07	2.33	-	14.84	
14:17	13.65	4.09	2.34	-	15.85	
14:18	13.63	4.11	2.29	-	16.46	
14:19	13.67	4.08	2.26	-	15.49	
14:20	13.67	4.07	2.24	-	15.03	
14:21	13.72	4.06	2.24	-	14.18	
14:22	13.69	4.06	2.24	-	14.35	
Average	13.71	4.06	2.28	-	13.74	

Sakalt P.

(Mr. Sakalt Phaleanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-02 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



ANALYZER CALIBRATION DATA

Lot No. 2397750-1

Client		Global Power Synergy PCL.	Location	HRSG #6
Date		14 Sep 23	Test Operator	Sakalt P.
O ₂ ANALYZER Model		TELEDYNE API T803	Serial No.	81
Span (%)		25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.08
Low-Level Gas	7.93	7.90	7.92	0.08
Span Gas	16.00	15.97	15.99	0.08

NO _x ANALYZER Model		HORIBA PG-350	Serial No.	TDSARGKP
Span (ppm)		200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.05	-0.01	0.02
Low-Level Gas	62.39	62.34	62.38	0.02
Span Gas	164.40	164.35	164.39	0.02

SO ₂ ANALYZER Model		TELEDYNE API 100EH	Serial No.	437
Span (ppm)		200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.02	-0.01	0.01
Low-Level Gas	78.75	78.73	78.74	0.00
Span Gas	159.90	159.88	159.89	0.00

CO ANALYZER Model		HORIBA PG-350	Serial No.	TDSARGKP
Span (ppm)		500		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

CO ₂ ANALYZER Model		TELEDYNE API T803	Serial No.	81
Span (%)		25		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.01	0.00	0.04
Low-Level Gas	8.10	8.11	8.10	0.04
Span Gas	16.01	16.02	16.01	0.04

Calibrated by

Sakalt P.

(Mr. Sakalt Phaleanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-02 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397750-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client		Global Power Synergy PCL.	Location	HRSG #6
Date		14 Sep 23	Test Operator	Sakalt P.

O ₂ ANALYZER Cylinder Conc. (%)		16.00	Span (%)	25
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	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.08	0.08
Upscale Gas	15.97	15.97	0.00	15.99	0.08	0.08

NO _x ANALYZER Cylinder Conc. (ppm)		184.40	Span (ppm)	200
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	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.05	-0.05	0.00	-0.01	0.02	0.02
Upscale Gas	164.35	164.35	0.00	164.39	0.02	0.02

SO ₂ ANALYZER Cylinder Conc. (ppm)		159.90	Span (ppm)	200
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	SO ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.02	-0.02	0.00	-0.01	0.01	0.01
Upscale Gas	159.88	159.88	0.00	159.89	0.00	0.00

CO ANALYZER Cylinder Conc. (ppm)		407.40	Span (ppm)	500
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	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.04	-0.04	0.00	-0.01	0.01	0.01
Upscale Gas	407.36	407.36	0.00	407.39	0.01	0.01

CO ₂ ANALYZER Cylinder Conc. (%)		16.01	Span (%)	25
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	CO ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.01	0.01	0.00	0.00	0.04	0.04
Upscale Gas	16.02	16.02	0.00	16.01	0.04	0.04

Calibrated by

Sakalt P.

(Mr. Sakalt Phaleanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-02 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	1
Date		14 Sep 23	Location	HRSG #6
Start Time		11:45	Test Operator	Sakalt P.
SO ₂ Analyzer Model		TELEDYNE API 100EH	Finish Time	12:05
NO _x /O ₂ Analyzer Model		HORIBA PG-350	Serial No.	437
CO/CO ₂ Analyzer Model		HORIBA PG-350	Serial No.	TDSARGKP
			Serial No.	TDSARGKP

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:45	14.08	3.86	6.33	0.02	7.78	
11:46	14.14	3.84	6.05	0.02	7.90	
11:47	14.13	3.85	6.05	0.02	8.14	
11:48	14.18	3.84	5.85	0.02	8.14	
11:49	14.16	3.86	5.68	0.02	7.90	
11:50	14.17	3.86	5.59	0.02	8.28	
11:51	14.21	3.85	5.63	0.02	7.90	
11:52	14.20	3.86	5.57	0.02	8.51	
11:53	14.18	3.88	5.57	0.02	7.15	
11:54	14.24	3.86	5.81	0.02	7.25	
11:55	14.23	3.87	5.62	0.02	7.39	
11:56	14.27	3.85	5.46	0.02	7.90	
11:57	14.30	3.83	5.74	0.02	8.14	
11:58	14.31	3.83	5.68	0.02	7.90	
11:59	14.32	3.84	5.85	0.02	8.14	
12:00	14.32	3.84	5.98	0.02	8.37	
12:01	14.33	3.84	5.57	0.02	8.14	
12:02	14.17	3.82	5.77	0.02	7.90	
12:03	14.13	3.85	5.59	0.02	8.13	
12:04	13.72	3.84	5.66	0.02	8.14	
12:05	14.10	3.81	5.79	0.02	8.89	
Average	14.18	3.85	5.75	0.02	8.00	

Sakalt P.

(Mr. Sakalt Phaleanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-02 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	2
Date		14 Sep 23	Location	HRSG #6
Start Time		12:08	Test Operator	Sakait P.
Finish Time		12:28		
SO ₂ Analyzer Model	TELEDYNE API 100EH		Serial No.	437
NO _x /O ₂ Analyzer Model	HORIBA PG-350		Serial No.	TDBARGKP
CO/CO ₂ Analyzer Model	HORIBA PG-350		Serial No.	TDBARGKP

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:06	14.15	3.80	5.90	0.02	7.76	
12:07	14.20	3.79	6.01	0.02	7.25	
12:08	14.20	3.81	6.00	0.02	8.37	
12:09	14.17	3.83	5.92	0.02	7.76	
12:10	14.18	3.84	5.40	0.02	7.90	
12:11	14.14	3.87	5.23	0.02	7.29	
12:12	14.13	3.90	5.36	0.02	5.89	
12:13	14.09	3.92	5.68	0.02	5.28	
12:14	14.02	3.95	5.59	0.02	4.53	
12:15	14.03	3.94	5.51	0.02	4.53	
12:16	14.06	3.93	5.63	0.02	4.15	
12:17	14.17	3.88	5.46	0.02	5.65	
12:18	14.22	3.87	5.25	0.02	6.78	
12:19	14.23	3.87	5.29	0.02	7.52	
12:20	14.26	3.86	5.22	0.02	7.90	
12:21	14.27	3.86	5.07	0.02	7.53	
12:22	14.23	3.88	5.09	0.02	7.90	
12:23	14.31	3.84	5.18	0.02	7.76	
12:24	14.16	3.83	5.12	0.02	7.90	
12:25	14.15	3.83	5.20	0.02	7.90	
12:26	13.86	3.85	5.16	0.02	8.14	
Average	14.16	3.88	5.44	0.02	6.94	

Sakait P.

(Mr. Sakait Phalsanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Global Power Synergy PCL	Run #	3
Date		14 Sep 23	Location	HRSG #6
Start Time		12:27	Test Operator	Sakait P.
SO ₂ Analyzer	Model	TELEDYNE API 100EH	Finish Time	12:47
NO _x /O ₂ Analyzer	Model	HORIBA PG-350	Serial No.	437
CO/CO ₂ Analyzer	Model	HORIBA PG-350	Serial No.	TDBARGKP
			Serial No.	TDBARGKP

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:27	14.07	3.83	5.16	0.02	7.91	
12:28	14.07	3.84	5.01	0.02	8.28	
12:29	14.11	3.84	5.12	0.02	5.80	
12:30	14.13	3.84	5.12	0.02	8.14	
12:31	14.12	3.86	5.01	0.02	8.51	
12:32	14.17	3.84	5.42	0.02	8.14	
12:33	14.16	3.85	4.98	0.02	8.14	
12:34	14.18	3.85	4.88	0.02	7.91	
12:35	14.21	3.85	4.99	0.02	8.14	
12:36	14.22	3.85	4.98	0.02	8.28	
12:37	14.25	3.84	4.90	0.02	8.28	
12:38	14.23	3.87	4.90	0.02	7.67	
12:39	14.28	3.84	5.01	0.02	7.91	
12:40	14.30	3.84	4.98	0.02	8.14	
12:41	14.30	3.84	5.13	0.02	7.77	
12:42	14.28	3.85	5.03	0.02	7.77	
12:43	14.28	3.85	4.77	0.02	7.91	
12:44	14.30	3.85	5.33	0.02	7.91	
12:45	14.33	3.83	5.03	0.02	7.77	
12:46	14.13	3.85	5.07	0.02	8.14	
12:47	14.12	3.85	5.37	0.02	8.14	
Average	14.20	3.85	5.06	0.02	7.94	

Sakait P.

(Mr. Sakait Phalsanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397707-1

ANALYZER CALIBRATION DATA

Client	: Global Power Synergy PCL.	Location	: Auxiliary Boiler
Date	: 15 Sep 23	Test Operator	: Sakait P.

O ₂ ANALYZER		Serial No.	: 774
Model	: TELEDYNE API 200EH		
Span (%)	: 25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.02	-0.01	0.04
Low-Level Gas	7.93	7.91	7.92	0.04
Span Gas	16.00	15.98	15.99	0.04

NO _x ANALYZER		Serial No.	: 774
Model	: TELEDYNE API 200EH		
Span (ppm)	: 200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.01
Low-Level Gas	82.39	82.36	82.38	0.01
Span Gas	164.40	164.37	164.39	0.01

CO ANALYZER		Serial No.	: 451
Model	: TELEDYNE API 300EM		
Span (ppm)	: 600		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.04	-0.01	0.01
Low-Level Gas	79.48	79.44	79.47	0.01
Span Gas	407.40	407.36	407.39	0.01

Calibrated by

Sakait P.

(Mr. Sakait Phalsanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



Lot No. 2397707-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	: Global Power Synergy PCL.	Location	: Auxiliary Boiler
Date	: 15 Sep 23	Test Operator	: Sakait P.

O ₂ ANALYZER		Span (%)	: 25
Cylinder Conc. (%)	: 16.00		

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.02	-0.02	0.00	-0.01	0.04	0.04
Upscale Gas	15.98	15.98	0.00	15.99	0.04	0.04

NO _x ANALYZER		Span (ppm)	: 200
Cylinder Conc. (ppm)	: 164.40		

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.01	0.01
Upscale Gas	164.37	164.37	0.00	164.39	0.01	0.01

CO ANALYZER		Span (ppm)	: 600
Cylinder Conc. (ppm)	: 407.40		

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.04	-0.04	0.00	-0.01	0.01	0.01
Upscale Gas	407.36	407.36	0.00	407.39	0.01	0.01

Calibrated by

Sakait P.

(Mr. Sakait Phalsanphieut)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	1
Global Power Synergy PCL.		Location	Auxiliary Boiler
Date	15 Sep 23	Test Operator	Sekait P.
Start Time	10:00	Finish Time	10:20
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EH	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:00	8.83	6.95	31.32	-	0.32	
10:01	8.84	6.93	31.26	-	0.45	
10:02	8.83	6.93	31.21	-	0.35	
10:03	8.83	6.93	31.16	-	0.35	
10:04	8.84	6.93	31.31	-	0.28	
10:05	8.81	6.95	31.34	-	0.48	
10:06	8.82	6.95	31.35	-	0.41	
10:07	8.81	6.94	31.35	-	0.40	
10:08	8.81	6.94	31.28	-	0.32	
10:09	8.80	6.93	31.27	-	0.42	
10:10	8.80	6.94	31.36	-	0.38	
10:11	8.82	6.94	31.37	-	0.47	
10:12	8.79	6.94	31.34	-	0.35	
10:13	8.77	6.95	31.40	-	0.31	
10:14	8.77	6.97	31.42	-	0.43	
10:15	8.78	6.97	31.29	-	0.48	
10:16	8.78	6.97	31.14	-	0.40	
10:17	8.79	6.97	31.06	-	0.25	
10:18	8.80	6.95	31.16	-	0.22	
10:19	8.81	6.96	31.13	-	0.36	
10:20	8.81	6.95	31.01	-	0.38	
Average	8.80	6.94	31.28	-	0.38	

Sekait P.

(Mr. Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	2
Global Power Synergy PCL.		Location	Auxiliary Boiler
Date	15 Sep 23	Test Operator	Sekait P.
Start Time	10:21	Finish Time	10:41
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EH	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:21	8.78	6.97	30.94	-	0.45	
10:22	8.79	6.99	31.09	-	0.37	
10:23	8.80	6.96	31.18	-	0.34	
10:24	8.79	6.96	31.24	-	0.37	
10:25	8.81	6.94	31.22	-	0.40	
10:26	8.82	6.96	31.28	-	0.27	
10:27	8.83	6.96	31.32	-	0.60	
10:28	8.80	6.97	31.32	-	0.56	
10:29	8.81	6.96	31.39	-	0.27	
10:30	8.83	6.93	31.49	-	0.30	
10:31	8.84	6.93	31.60	-	0.40	
10:32	8.81	6.94	31.56	-	0.40	
10:33	8.80	6.96	31.59	-	0.45	
10:34	8.80	6.96	31.68	-	0.45	
10:35	8.80	6.97	31.67	-	0.45	
10:36	8.80	6.96	31.57	-	0.31	
10:37	8.79	6.97	31.56	-	0.32	
10:38	8.79	6.97	31.56	-	0.35	
10:39	8.78	6.98	31.56	-	0.50	
10:40	8.79	6.98	31.56	-	0.39	
10:41	8.81	6.96	31.48	-	0.27	
Average	8.80	6.98	31.42	-	0.39	

Sekait P.

(Mr. Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



EMISSION TEST RESULT

Client		Run #	3
Global Power Synergy PCL.		Location	Auxiliary Boiler
Date	15 Sep 23	Test Operator	Sekait P.
Start Time	10:42	Finish Time	11:02
SO ₂ Analyzer Model	TELEDYNE API 100EH	Serial No.	437
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	774
CO/CO ₂ Analyzer Model	TELEDYNE API 300EH	Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:42	8.81	6.94	31.31	-	0.49	
10:43	8.80	6.95	31.14	-	0.36	
10:44	8.82	6.95	31.01	-	0.37	
10:45	8.81	6.95	31.12	-	0.45	
10:46	8.78	6.96	31.21	-	0.50	
10:47	8.79	6.95	31.39	-	0.37	
10:48	8.80	6.97	31.40	-	0.33	
10:49	8.79	6.97	31.18	-	0.34	
10:50	8.80	6.96	31.07	-	0.35	
10:51	8.80	6.95	30.95	-	0.45	
10:52	8.79	6.96	30.95	-	0.38	
10:53	8.78	6.96	30.83	-	0.36	
10:54	8.76	6.97	30.67	-	0.24	
10:55	8.78	6.97	30.93	-	0.22	
10:56	8.81	6.97	30.99	-	0.26	
10:57	8.79	6.97	30.89	-	0.34	
10:58	8.79	6.96	30.86	-	0.54	
10:59	8.78	6.95	30.97	-	0.43	
11:00	8.77	6.97	31.12	-	0.34	
11:01	8.79	6.98	31.22	-	0.36	
11:02	8.81	6.96	31.31	-	0.40	
Average	8.79	6.98	31.08	-	0.37	

Sekait P.

(Mr. Sekait Phaisanphit)

Environmental Field Scientist (4)

FORM NO.: F 06-062 REVISION NO.: 2 ISSUE DATE: 3/06/19

ALS Laboratory Group



an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
6141 Eastern Road
Plymouthville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE
(THAILAND) LTD
E04N189E3HA0002
Cylinder Number: GN0027210
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12002
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 180-402340013-1
Cylinder Volume: 247.2 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Feb 11, 2022

Expiration Date: Feb 11, 2030

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-13/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder trim is total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration (require: M concentrations are 1 mole/mole basis unless otherwise noted).

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	80.00 PPM	82.39 PPM	G1	+/- 1.0% NIST Traceable	02/04/2022, 02/11/2022
CARBON MONOXIDE	80.00 PPM	79.48 PPM	G1	+/- 0.8% NIST Traceable	02/04/2022
NITRIC OXIDE	80.00 PPM	82.38 PPM	G1	+/- 1.0% NIST Traceable	02/04/2022, 02/11/2022
SULFUR DIOXIDE	80.00 PPM	78.75 PPM	G1	+/- 0.9% NIST Traceable	02/04/2022, 02/11/2022
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	06010212	KAL004777	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 18, 2024
NTRM	200810-15	CC730106	98.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%	Oct 06, 2026
NTRM	200810-04	CC708044	98.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%	Oct 06, 2026
GMS	1240068913B	CC323707	4.097 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Sep 03, 2024
NTRM	11010418	KAL004813	99.5 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jul 26, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO	FTIR	Feb 03, 2022
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 10, 2022
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jan 27, 2022
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jan 20, 2022

Triad Data Available Upon Request

NOTES: Gross Weight: 48.5 Kg
Net Weight: 8.1 Kg



CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N198E3HAD026 Reference Number: 82-401257890-1
Cylinder Number: ND62877 Cylinder Volume: 247.2 CF
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2215 PSIG
PGVP Number: B52018 Valve Outlet: 600
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Aug 07, 2018

Expiration Date: Aug 07, 2026

Calibration performed in accordance with EPA Traceability Protocol for Analytical Certification of Gasphase Calibration Standards (May 2012) document EPA 8200-R-12-011, using the assay procedure listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated (only with a confidence level of 95%). There are no significant impurities which affect the use of this calibration cylinder. All concentrations are on a molar basis unless otherwise noted. Do Not Use This Cylinder Below 100 psig, i.e. 6.9 barg/absolute.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	150.0 PPM	154.4 PPM	G1	+/- 1.1% NIST Traceable	07/20/2015, 08/07/2018
NITRIC OXIDE	150.0 PPM	154.4 PPM	G1	+/- 1.1% NIST Traceable	07/20/2015, 08/07/2018
SULFUR DIOXIDE	150.0 PPM	155.8 PPM	G1	+/- 1.1% NIST Traceable	07/20/2015, 08/07/2018
CARBON MONOXIDE	400.0 PPM	407.4 PPM	G1	+/- 1.1% NIST Traceable	07/20/2015
NITROGEN	Balance				

Type	Lot ID	Cylinder No.	Concentration	Uncertainty	Expiration Date
NTRM	1706241	58027997	100.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.2%	May 11, 2019
PRM	12358	5804110	25.86 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMS	7042010104	CC508841	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2020
NTRM	11010414	KAL004792	99.0 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jul 26, 2023
NTRM	1500353	CC481507	481.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 06, 2021

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicoret 6700 APV1100351 CO	FTR	Jul 19, 2018
Nicoret 6700 APV1100351 NO	FTR	Jul 12, 2018
Nicoret 6700 APV1100351 NO2	FTR	Aug 03, 2018
Nicoret 6700 APV1100351 SO2	FTR	Aug 02, 2018

Triad Data Available Upon Request

NOTES:
Net weight: 8107 grams
Gross weight: 47090 grams

This calibration was performed in accordance with the May 2012 EPA Traceability Protocol for Analytical Certification of Gasphase Calibration Standards (May 2012) document EPA 8200-R-12-011. All testing processes and measurements conform to the requirements of ISO 9001:2008 and relate only to items identified on this certificate. This certificate is valid only for the items identified on this certificate. This certificate is not to be reproduced in full without written approval of the issuer.

ACCREDITED

TESTING CERT No. 3082.05

Approved for Release

Page 1 of 2

CERTIFICATE OF ANALYSIS

Customer Details: ALS Laboratory Group (Thailand)		Production Order Number: 90132928 Material Number: 478100-J-44 Certification Date: 20-Jan-2016 Expiry Date: 20-Jan-2024
Cylinder Description: Steel 47 L		
Certificate Number: 4676/15		Analyst: THITIRAT LOYRAT
Cylinder Number: 580730		Approve: SUKANYA KAMUTHARAT
Nominal Cylinder Content: 6.520 M³		
Nominal Pressure: 145.0 Bar		
Valve Outlet: CGA 590 BRASS		To Re-Order Please Quote: 478100-J-44
Comment: <ul style="list-style-type: none"> It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig. Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component. Keep and use in well-ventilated and secure area. 		

Page 1 of 2

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)
157 หมู่ 14, บางกะปิ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
เบอร์โทร: 02-2338-4333 โทรสาร: 02-2338-4333
แฟกซ์: 02-2338-4333

Linde (Thailand) Public Company Limited
157 Moo 14, Bangkapi Road, Klongtoey District, Klongtoey Suburb, Bangkok 10110, Thailand
Tel: (66) 2338-4333 Fax: (66) 2338-4333
Bangkok Plant: 105 Moo 1, Bangpakong, A Bangpakong, Chachoengsao 24180
Thailand, Tel: (66) 38-570-479-93 Fax: (66) 38-570-323

CERTIFICATE OF ANALYSIS

Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Oxygen in Nitrogen	8.00 %	7.93 %	+/- 1% relative	(2) I-PB-354	20-Jan-2015

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expiry Date
Oxygen in Nitrogen	243628SG	25.08 ± 0.13 %	19-Aug-2017

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Servomex 4100 O2 Analyzer	Paramagnetic	23-Dec-2015

Method of Analysis:
1. Gas Chromatograph
2. Paramagnetic Oxygen Analyzer
3. Electrochemical Oxygen Analyzer
4. Electrochemical Moisture Analyzer
5. Total Hydrocarbon Analyzer
6. Other specified

Cylinder Number: **550730**
Production Order Number: **90132928**

Certification Date: **20-Jan-2016**
Expiration Date: **20-Jan-2024**

Page 2 of 2

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)
157 หมู่ 14, บางกะปิ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
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Tel: (66) 2338-4333 Fax: (66) 2338-4333
Bangkok Plant: 105 Moo 1, Bangpakong, A Bangpakong, Chachoengsao 24180
Thailand, Tel: (66) 38-570-479-93 Fax: (66) 38-570-323

CERTIFICATE OF ANALYSIS

Customer Details: ALS Laboratory Group (Thailand)		Production Order Number: 90137389 Material Number: 557200-J-44 Certification Date: 24-Sep-2016 Expiry Date: 24-Sep-2024
Cylinder Description: STEEL 47 L		
Certificate Number: 285716		Analyst: THITIRAT LOYRAT
Cylinder Number: 363075		Approve: SUKANYA KAMUTHARAT
Nominal Cylinder Content: 6.560 M³		
Nominal Pressure: 145.0 Bar		
Valve Outlet: CGA 590 BRASS		To Re-Order Please Quote: 557200-J-44
Comment: <ul style="list-style-type: none"> It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig. Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component. Keep and use in well-ventilated and secure area. 		

Page 1 of 2

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)
157 หมู่ 14, บางกะปิ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
เบอร์โทร: 02-2338-4333 โทรสาร: 02-2338-4333
แฟกซ์: 02-2338-4333

Linde (Thailand) Public Company Limited
157 Moo 14, Bangkapi Road, Klongtoey District, Klongtoey Suburb, Bangkok 10110, Thailand
Tel: (66) 2338-4333 Fax: (66) 2338-4333
Bangkok Plant: 105 Moo 1, Bangpakong, A Bangpakong, Chachoengsao 24180
Thailand, Tel: (66) 38-570-479-93 Fax: (66) 38-570-323



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :		13 Jul 23	Ambient Temperature (°C)		29
Calibration sheet No. : C-130723-BKK_FS0469			Relative Humidity (%) :		60
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 : 14 Aug 24		
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass
	100	101	1	±3	Pass
	150	150	0	±3	Pass
	200	200	0	±3	Pass
	250	250	0	±3	Pass
	300	300	0	±3	Pass
	500	501	1	±3	Pass
Probe	100	101	1	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Oven	100	101	-	±3	-
	120	121	-	±3	-
	140	141	-	±3	-
Filter	100	102	2	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	9	-1	±3	Pass
	20	19	-1	±3	Pass
Meter	0	-1	-1	±3	Pass
	25	24	-1	±3	Pass
	50	48	-2	±3	Pass
AUX	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของเครื่องมือวัด

Calibrated by : Saksit Phaisanphiset (Mr. Saksit Phaisanphiset) Field Scientist (4)
Approved by : Nattapon Jengwarewong (Mr. Nattapon Jengwarewong) Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 2 ISSUE DATE: 16/2/23



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 13 Jul 23		Nozzle Set ID. : BKK_FS0474	
Calibration Sheet No. : C-130723-BKK_FS0474		Vernier Caliper ID. : BKK_FS1123	

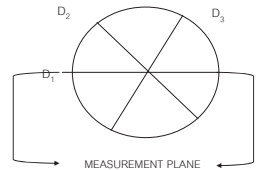
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	(D ₁ + D ₂ + D ₃) / 3
	D ₁	D ₂	D ₃	ΔD	D _{avg}
1	0.300	0.299	0.300	0.001	0.300
2	0.450	0.450	0.450	0.000	0.450
3	0.599	0.602	0.601	0.003	0.601
4	0.763	0.769	0.770	0.007	0.767
5	0.931	0.932	0.932	0.001	0.932
6	1.090	1.092	1.092	0.002	1.091
7	1.264	1.263	1.264	0.001	1.264
8	1.599	1.600	1.599	0.001	1.599

Where :

D₁, D₂, D₃ = 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} = (D₁ + D₂ + D₃) / 3



Calibrated by : Saksit Phaisanphiset (Mr. Saksit Phaisanphiset) Field Scientist (4)
Approved by : Nattapon Jengwarewong (Mr. Nattapon Jengwarewong) Field Specialist (1)

FORM NO.: F 06-028 REVISION NO.: 2 ISSUE DATE: 16/2/23



Calibration Certificate

Certificate No: G 660041
Date of issue : 24-Jan-23

Instrument description : Flue gas Analyzer
Instrument model : Testo 340
Instrument serial no. : 62150585
ID no. or control no. : RYG_FS0465
Manufacturer : Testo SE & Co. KGAA
Probe description : -
Probe model : -
Probe serial : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO., LTD.
Customer address : 104 Phatthanakan 46, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-230166
Receiving date. : 20-Jan-23
Parameter of calibration : Gas Calibration/Oxygen 2.498,10.04,21.02 %Vol, Carbon Monoxide 80.14,309.9,1003 ppm, Nitric Oxide 30.08,150.9,320.6 ppm, Sulphur Dioxide 50.04,80.96,601.1 ppm
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 0.5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsoonghong, Laksi, Bangkok 10210
Calibration procedure no.: WI-CL-29-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement 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 reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).
Date of calibration : 23-Jan-23

Mr. Sedawut Nueathong
Calibration Technician

Mrs. Nongluck Wongsettee
Technical Manager



Calibration Certificate

Certificate No.: G 660041

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0841-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0049-22	Nimt	14-Feb-27
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2583/22	Linde	09-Aug-24
Nitric Oxide (NO) 30.08 ppm	SGS10068	Nimt	13-Jun-24
Nitric Oxide (NO) 150.9 ppm	2857/21	Linde	27-Jun-23
Nitric Oxide (NO) 320.6 ppm	2944/21	Linde	02-Jul-23
Sulphur Dioxide (SO ₂) 50.04 ppm	3205/21	Linde	25-Jul-23
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO ₂) 601.1 ppm	3204/21	Linde	20-Jul-23

Measured room conditions

Temperature : 22.6 °C Humidity : 57.8 %RH Pressure : 1015.3 mbar
Calibration conditions
Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1018.2 mbar

Calibration Results (before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.498	2.46	-0.038	0.20
O ₂ (%Vol)	10.04	9.93	-0.11	0.40
O ₂ (%Vol)	21.02	21.18	0.16	0.80
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	309.9	326	16.1	6.0
CO (ppm)	1003	1061	58	12
NO (ppm)	30.08	27	-3.08	8.0
NO (ppm)	150.9	144	-6.9	8.0
NO (ppm)	320.6	309	-11.9	12
SO ₂ (ppm)	50.04	49	-1.04	6.0
SO ₂ (ppm)	100.8	99	-1.8	6.0
SO ₂ (ppm)	601.1	597	-4.1	13

Calibration Results (after adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.498	2.46	-0.038	0.20
O ₂ (%Vol)	10.04	9.93	-0.11	0.40
O ₂ (%Vol)	21.02	21.18	0.16	0.80
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	309.9	309	-0.9	6.0
CO (ppm)	1003	1002	-1	12
NO (ppm)	30.08	30	-0.08	8.0
NO (ppm)	150.9	153	2.1	8.0
NO (ppm)	320.6	316	-4.6	12
SO ₂ (ppm)	50.04	49	-1.04	6.0
SO ₂ (ppm)	100.8	99	-1.8	6.0
SO ₂ (ppm)	601.1	597	-4.1	13

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

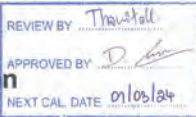
End of Report

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel : +66 2543 8361-8, e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration



Model Number : MSE224S-100-DU Certificate No. : 23BCI0115
Description : Analytical Balance Issued Date : Friday, March 03, 2023
Serial Number : 0031709552 Reference No. : 204833
ID No. : RYG_EN0003
Manufacturer : Sartorius Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluak Daeng, Rayong 21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T. Maenam Khu, A. Pluak Daeng, Rayong 21140, Thailand.

Calibrated By : Mr. Chonchai Inthana
Calibration Date : Wednesday, March 01, 2023

Metrological data :
Capacity : 220 g Readability : 0.0001 g
Reasons for calibration :
☐ New Installation ☐ Service / Repaired ☒ Re-calibration / Maintenance
Equipment Condition : ☒ Good Operate ☐ Fair

Measurement Method : UKAS Publication Ref : Lab 14
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2, YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp. Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

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

Mr. Chonchai Inthana (Technical Manager)



SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel : +66 2543 8361-8 Fax: +66 2543-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : MSE224S-100-DU Certificate No. : 23BCI0115
Description : Analytical Balance Issued Date : Friday, March 03, 2023
Serial Number : 0031709552 Reference No. : 204833
ID No. : RYG_EN0003
Manufacturer : Sartorius Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).		
Nominal Value : (Low Load)	20.0000	200.0000	Nominal value :	100	g
20 g	20.0001	200.0000	Tolerance	0.0004	g
Tolerance	0.0001	0.0001	Difference		
Nominal Value : (High Load)	20.0000	200.0000	1	-	
200 g	20.0000	200.0001	2	0.0001	
Tolerance	0.0001	0.0001	3	0.0000	
Standard Deviation	0.00004	0.00005	4	0.0000	
			5	0.0001	
			6	-	

Linearity

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

Tolerance	0.0002 g			
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00013
0.05	0.0500	0.0500	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
0.5	0.5000	0.5000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00024
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	200.0001	0.0001	0.00032

End of Report

SOP FM 33 03 February 2022



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	13 Jul 23	Ambient Temperature (°C)	29
Calibration sheet No. :	C-130723-RYG_FS0317	Relative Humidity (%) :	60
Digital Temperature ID :	RYG_FS0317	Reference Temperature ID	BKK_FS1144
Serial No. :	1706003	Serial No. :	20109006013
Model :	XC-62-CV	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	100	0	±3	Pass
	150	150	0	±3	Pass
	200	200	0	±3	Pass
Probe	250	251	1	±3	Pass
	300	301	1	±3	Pass
	500	501	1	±3	Pass
	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Oven	100	-	-	±3	-
	120	-	-	±3	-
	140	-	-	±3	-
Filter	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	1	1	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของงานวัดที่อนุญาต

Calibrated by : Jittakorn Approved by : Nattapon Jengwareewong
(Mr. Jittakorn.Sriwasa) Mr. Nattapon Jengwareewong
Field Scientist (2) Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 2 ISSUE DATE: 16/2/23

FORM NO.: F 06-023 REVISION NO.: 1 ISSUE DATE: 30/6/22

DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 13 Jul 23 Barometric Pressure (mm.Hg) : 751
Next Calibration Date : 13-Jan-24 Relative Humidity (%) : 60.0
Temperature (°C) : 29.0

Dry Gas Meter Data : Reference Dry Gas Meter Data
Calibration sheet No. : C-DDMMYY-RYG_FS0317 Reference Dry Gas Meter ID : BKK_FS0629
Dry Gas Meter ID : RYG_FS0317 Serial No. : 1607009
Serial No. : 1706003 Correction Factor (Y) : 1.0000
Model No. : XC-62-CV Next Calibration Date : 9 Dec 23

Reference Dry Gas Meter Calibration				Dry Gas Meter							Dry Gas Meter
Vr (Liters)			Tr	Vm (Liters)			Ti	To	Avg. Tm	Correction	
Final	Initial	Total	(^o C)	Final	Initial	Total	(^o C)	(^o C)	(^o C)	Factor (Y)	
30.00	0.00	30.00	26.0	29.89	0.00	29.89	28.0	28.0	28.0	1.0104	
30.00	0.00	30.00	26.0	29.86	0.00	29.86	28.0	28.0	28.0	1.0114	
60.00	0.00	60.00	26.0	59.88	0.00	59.88	29.0	29.0	29.0	1.0121	
60.00	0.00	60.00	27.0	60.18	0.00	60.18	29.0	29.0	29.0	1.0037	
90.00	0.00	90.00	27.0	90.20	0.00	90.20	30.0	30.0	30.0	1.0078	
90.00	0.00	90.00	27.0	90.11	0.00	90.11	31.0	31.0	31.0	1.0121	
									Avg.	1.0096	

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.05 from average.

Calibrate by : Jittakorn

Approved by : Nattapon Jengwareewong

Mr. (Jittakorn.Sriwasa)
Field Scientist (2)

Mr. Nattapon Jengwareewong
Specialist (1)



DRY GAS METER CALIBRATION TEST REPORT

Calibration Date : 23 Aug 23
Next Calibration Date : 23-Feb-24

Barometric Pressure (mm.Hg) : 753
Relative Humidity (%) : 60.0
Temperature (°C) : 30.0

Dry Gas Meter Data
Calibration sheet No. : C-230823-BKK_FS0465
Dry Gas Meter ID : BKK_FS0465
Serial No. : 1302005
Model No. : XC-60C-V

Reference Dry Gas Meter Data
Reference Dry Gas Meter ID : BKK_FS0629
Serial No. : 1607009
Correction Factor (Y) : 1.0000
Next Calibration Date : 9 Dec 23

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter
Vr (Liters)			Tr	Vm (Liters)			Ti	To	Avg. Tm	Correction
Final	Initial	Total	(°C)	Final	Initial	Total	(°C)	(°C)	(°C)	Factor (Y)
30.00	0.00	30.00	27.0	30.04	0.00	30.04	27.0	27.0	27.0	0.9987
30.00	0.00	30.00	27.0	30.05	0.00	30.05	27.0	27.0	27.0	0.9983
60.00	0.00	60.00	28.0	60.06	0.00	60.06	28.0	28.0	28.0	0.9990
60.00	0.00	60.00	28.0	60.05	0.00	60.05	28.0	28.0	28.0	0.9992
90.00	0.00	90.00	28.0	90.08	0.00	90.08	29.0	29.0	29.0	1.0024
90.00	0.00	90.00	28.0	90.10	0.00	90.10	29.0	29.0	29.0	1.0022
Avg.										1.0000

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual \pm 0.05 from average.

Calibrate by :

Jittakorn

Mr. (Jittakorn.Sriwasa)
Field Scientist (2)

Approved by :

Nattapon Jengwareewong

Mr. (Nattapon Jengwareewong)
Specialist (1)

FORM NO.: F 06-023 REVISION NO.: 1 ISSUE DATE: 30/6/22



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 23 Aug 23		Ambient Temperature (°C) 30			
Calibration sheet No. : C-230823-BKK_FS0467		Relative Humidity (%) : 60			
Digital Temperature ID : BKK_FS0467		Reference Temperature ID BKK_FS1144			
Serial No. : 1302005		Serial No. : 201090006013			
Model : XC-572-V		Model : Digicon-CC-VT-MS			
		Next Calibrate : 14 Aug 24			
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass
	100	99	-1	±3	Pass
	150	151	1	±3	Pass
	200	201	1	±3	Pass
	250	251	1	±3	Pass
Probe	300	301	1	±3	Pass
	500	501	1	±3	Pass
	100	99	-1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
	100	-	-	±3	-
	120	-	-	±3	-
Filter	140	-	-	±3	-
	100	99	-1	±3	Pass
	120	121	1	±3	Pass
Exit	140	141	1	±3	Pass
	0	0	0	±3	Pass
	10	9	-1	±3	Pass
Meter	20	19	-1	±3	Pass
	0	0	0	±3	Pass
	25	24	-1	±3	Pass
AUX	50	49	-1	±3	Pass
	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัด

Calibrated by :

Jittakorn

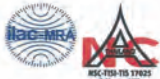
(Mr.Jittakorn.Sriwasa)
Field Scientist (2)

Approved by :

Nattapon Jengwareewong

(Mr.Nattapon Jengwareewong)
Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 2 ISSUE DATE: 16/2/23



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

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

Environment Condition: Temperature 23.1 °C \pm 3.2 °C
Humidity 85.4 %RH \pm 3.2 %RH

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

Calibration By: Mr. Chattuphon Fothong
Calibration Date: 27 September 2022
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 Star Scientific Limited.

The standard for Wavelength Certificate No. 91416 and 91435
The standard for Photometric Certificate No. 91441 and 101088
The standard for Stray light Certificate No. 101041 and 101040
The standard for Spectral resolution Certificate No. 101037

(Mr. Chattuphon Fothong)
Person in charge

(Mr. Thalerkwest Pongnam)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.

The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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

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CALFM-C06-13: 20 Jul 2022



Certificate No.: C06220464

Page 2 of 3

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	418.4	0.21	0.14	
536.66	536.7	-0.04	0.14	
637.98	638.3	-0.32	0.14	
748.46	748.8	-0.32	0.14	
807.03	807.4	-0.37	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5605	0.563	-0.0025	0.0045
	0.7334	0.737	-0.0036	0.0045
	1.0534	1.057	-0.0036	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5503	0.553	-0.0027	0.0045
	0.7179	0.720	-0.0021	0.0045
	1.0312	1.034	-0.0028	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5024	0.506	-0.0036	0.0045
	0.6693	0.672	-0.0027	0.0045
	0.9604	0.964	-0.0036	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5168	0.519	-0.0022	0.0045
	0.8903	0.891	-0.0007	0.0045
	0.9604	0.962	-0.0016	0.0045
580 nm	0.0000	0.000	0.0000	0.0045
	0.5525	0.554	-0.0015	0.0045
	0.7175	0.718	-0.0005	0.0045
	1.0301	1.031	-0.0009	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5367	0.538	-0.0013	0.0045
	0.6847	0.685	-0.0003	0.0046
	0.9823	0.983	-0.0007	0.0045

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Delivering Growth - In Asia and Beyond.

CALFM-C06-13: 20 Jul 2022

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
	0.7423	0.744	-0.0017	0.0083
257 nm	0.0000	0.000	0.0000	0.0080
	0.8609	0.861	-0.0001	0.0084
313 nm	0.0000	0.000	0.0000	0.0080
	0.2895	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6381	0.638	0.0001	0.0080
Stray light *				
Standard: cut-off UUC: Wavelength (nm) UUC: Transmission (%) Absorbance (A)				
260.67 +/- 0.11 nm 260.7 2.1 1.678				
391.94 +/- 0.11 nm 391.9 1.7 1.770				
Spectral Resolution *				
Nominal Concentration 0.02 % v/v Peak: Trough: Ratio: SBW				
Standard Wavelength (nm) 268.60 266.63 1.39 2.00				
UUC: Wavelength (nm) 268.2 266.1				
Std Absorbance (A) 0.4810 0.3176				
Absorbance (A) 0.373 0.268				

* Calibration Marked * Not TISI Accredited * In this Certificate has been included for completeness.

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
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CALFM-C06-13: 20 Jul 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
27 Sep 2022			27 Sep 2022		
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. สวิตซ์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวควบคุมเลือกความยาวคลื่น (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"/> 656.1 น้ 656.1 nm	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<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. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความทึบที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการบ่อสว่านของแสง (>= 2.5 ไม่น้เกิน 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. ระบบท่อส่งยาและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพื่อส่งมอบหมาย :

Mr. Chattuphon Folthong
Service Engineer

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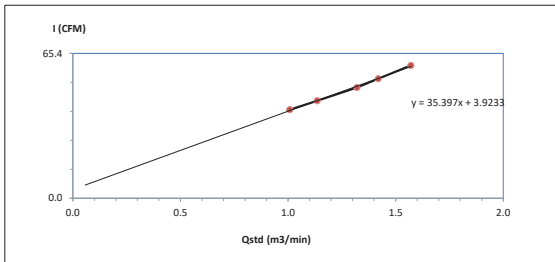
CAL-FM-R31-03: 20 Jul 2022



High Volume Air Sampler Calibration Worksheet

Project Site :	Global Power Synergy Public Company Limited	Barometric Pressure (mm Hg) :	755
Calibrate Location :	วัดหนองแขบ	Temperature (°C) :	31
Calibrate Date :	10-Sep-23	High Volume ID :	RYG-FS0182
CalibrationSheet No.:	C-100923-RYG-FS0182	High Volume Model :	TE-5170D
Calibrator ID:	RYG-FS0206	High Volume S/N :	5335
Calibrator Model :	TE-5028A	Calibrator Slope :	1.47433
Calibrator S/N :	1543	Calibrator Intercept :	-0.01503

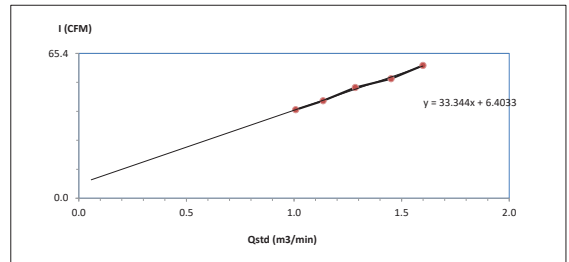
Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	1.0078	40	Slope : 35.397x + 3.9233 Intercept : 3.9233 Correlation Coefficient : 0.9983
2	2.8	1.1350	44	
3	3.8	1.3198	50	
4	4.4	1.4190	54	
5	5.4	1.5704	60	

Calibrated by จตุรัสชัย
(Mr.Chatchai Sukpia)
Field Scientist(1)Approved by : น.นพปง จันทราน
(Mr. Noppong Jantarapan)
Enviro Field Coordinator Scientist (3)

High Volume Air Sampler Calibration Worksheet

Project Site :	Global Power Synergy Public Company Limited	Barometric Pressure (mm Hg) :	755
Calibrate Location :	วัดบางพลี	Temperature (°C) :	31
Calibrate Date :	10-Sep-23	High Volume ID :	RYG-FS0178
CalibrationSheet No.:	C-100923-RYG-FS0178	High Volume Model :	TE-5170D
Calibrator ID:	RYG-FS0206	High Volume S/N :	4804
Calibrator Model :	TE-5028A	Calibrator Slope :	1.47433
Calibrator S/N :	1543	Calibrator Intercept :	-0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	1.0078	40	Slope : 33.344x + 6.4033 Intercept : 6.4033 Correlation Coefficient : 0.9974
2	2.8	1.1350	44	
3	3.6	1.2850	50	
4	4.6	1.4506	54	
5	5.6	1.5990	60	

Calibrated by จตุรัสชัย
(Mr.Chatchai Sukpia)
Field Scientist(1)Approved by : น.นพปง จันทราน
(Mr. Noppong Jantarapan)
Enviro Field Coordinator Scientist (3)

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-8, e-mail: service.thailand@sartorius.com



NSC-TIS-715 17023
CALIBRATION 0426

SARTORIUS

REVIEW BY: *Thani*
APPROVED BY: *D. A.*
NEXT CAL. DATE: 01/03/24

Certificate of Calibration

Model Number: LA130S-F Certificate No.: 23BCI0110
Description: Analytical Balance Issued Date: Friday, March 03, 2023
Serial Number: 25409664 Reference No.: 204833
ID No.: RYG_EN0001
Manufacturer: Sartorius Page No.: 1 of 2

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu. A. Pluak Daeng, Rayong 21140, Thailand.

Calibrated Place: ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T. Maenam Khu. A. Pluak Daeng, Rayong 21140, Thailand.

Calibrated By: Mr. Chonchai Inthana
Calibration Date: Wednesday, March 01, 2023

Metrological data:
Capacity: 150 g Readability: 0.0001 g
Ambients Conditions:
Temperature: 24.2 °C ± 5.0 °C
Humidity: 60.0 % RH ± 10.0 % RH
Pressure: ±

Reasons for calibration:
☐ New Installation ☐ Service / Repair ☒ Re-calibration / Maintenance
Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref: Lab 14
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2, YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp. Lubron MHB-382SD	DKSH	C19220444	5-Sep-2023

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

Mr. Chonchai Inthana (Technical Manager)

SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-8 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number: LA130S-F Certificate No.: 23BCI0110
Description: Analytical Balance Issued Date: Friday, March 03, 2023
Serial Number: 25409664 Reference No.: 204833
ID No.: RYG_EN0001
Manufacturer: Sartorius Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.	The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).
Nominal Value : (Low Load) 10 g Tolerance 0.0001 g	Nominal value: 50 g Tolerance 0.0004 g
Nominal Value : (High Load) 100 g Tolerance 0.0001 g	
Standard Deviation 0.00009 0.00006	

Linearity

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

Tolerance		0.0002 g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00022
0.05	0.0500	0.0500	0.0000	0.00023
0.1	0.1000	0.1000	0.0000	0.00023
0.5	0.5000	0.5000	0.0000	0.00023
1	1.0000	1.0000	0.0000	0.00023
2	2.0000	2.0000	0.0000	0.00023
5	5.0000	5.0000	0.0000	0.00022
10	10.0000	10.0001	0.0001	0.00024
20	20.0000	20.0001	0.0001	0.00023
100	100.0000	100.0002	0.0002	0.00026

End of Report.

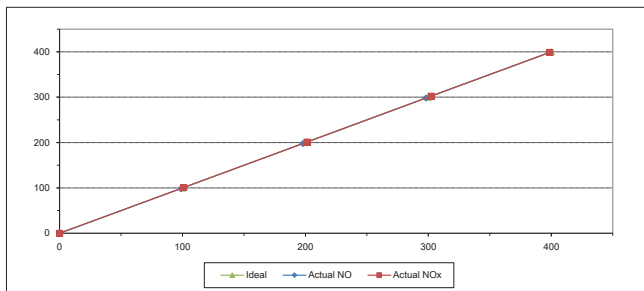
SOP FM 33 03 February 2022



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-23	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2198	Equipment ID	RYG_FS0252
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	101.00	1.00	1.00
2	200.00	198.00	-2.00	-1.00	201.30	1.30	0.65
3	300.00	298.10	-1.90	-0.63	302.30	2.30	0.77
4	400.00	398.20	-1.80	-0.45	398.80	-1.20	-0.30
AVERAGE (%)				-0.64			0.44



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrantont)
Assistant General Manager

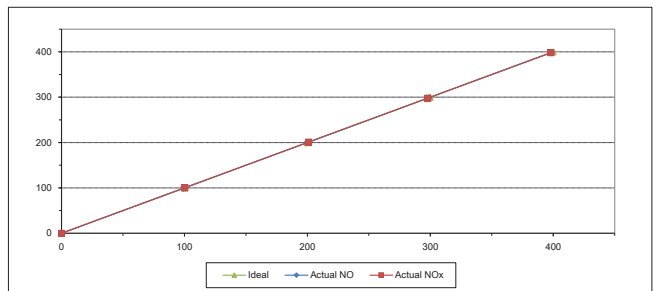
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-23	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	200E
Serial No.	1578	Equipment ID	BKK_FS0735
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	100.30	0.30	0.30
2	200.00	199.30	-0.70	-0.35	201.00	1.00	0.50
3	300.00	298.50	-1.50	-0.50	298.00	-2.00	-0.67
4	400.00	398.50	-1.50	-0.38	398.10	-1.90	-0.47
AVERAGE (%)				-0.38			-0.05



Calibrated By

(Mr. Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sarayuth Jittrantont)
Assistant General Manager

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

MEASUREMENT RESULTS¹

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 ₁₀₀ Degree (°)	D ₁₀₀ Degree (°)	Error Degree (°)	U (k=2) Degree (°)
0.000	0	0	0	0.59
4.99	45.000	43	-2	0.74
	90.000	88	-2	0.74
	135.000	133	-2	0.74
	180.000	179	-1	0.74
	225.000	227	2	0.74
	270.000	272	2	0.74
	315.000	317	2	0.74

Remark:

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

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration



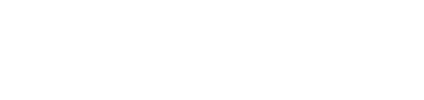
Remark:

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

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration



MEASUREMENT RESULTS¹

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 30 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{meas} (m/s)	Error (m/s)	U (k=2) (m/s)
0.983	23.60	23.70	0.7	-0.3	0.18
2.024	23.74	23.70	1.7	-0.3	0.18
3.044	23.50	23.70	2.9	-0.2	0.18
4.119	23.82	23.70	3.9	-0.2	0.19
5.02	23.50	23.70	4.9	-0.2	0.18
5.99	23.88	23.70	5.8	-0.2	0.18
7.08	23.50	23.70	6.9	-0.1	0.20
8.18	23.58	23.70	8.0	-0.2	0.18
9.11	23.50	23.70	9.0	-0.1	0.19
10.08	23.66	23.70	10.0	-0.1	0.25
11.15	23.32	23.70	11.0	-0.2	0.21
12.14	23.66	23.70	12.0	-0.2	0.20
13.20	23.32	23.70	13.2	0.0	0.25
14.25	23.50	23.70	14.9	-0.1	0.27
15.23	23.30	23.70	15.1	-0.2	0.27
16.29	23.40	23.70	16.2	-0.1	0.23

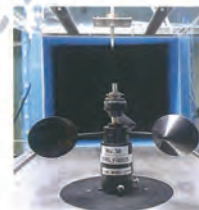
Remark:

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

² Velocity of standard

³ 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

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM MANUFACTURER MODEL/TYPE

: Wind Direction Sensor
: Novallene
: Sensor: WS-02F
Data logger: 110-WS-250L-D

SERIAL NUMBER

: Sensor: WSD-014

ID NUMBER

: Data logger: AS789

CONDITION AS-RECEIVED

: RWG JS0531

CUSTOMER

: Used item
: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

: 16 Jan 2023

MEASUREMENT DATE

: 19 Jan 2023

ISSUE DATE

: 20 Jan 2023

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 : 1010.1 ± 10 hPa

PLACE OF CALIBRATION

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

CALIBRATION CONDITION

: Wind tunnel cross-section area 900 cm²
Win direction frontal area 129 cm²
Diameter of mounting pipe 129 mm
Blockage ratio of test object 0.143 [-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.6) °C, (46.6) %RH and (1014.9) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thichai
☐ Miss Jitraporn Lerttongphol

Approved signature:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Inside 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 "m"²

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

MEASUREMENT RESULTS¹

The 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 and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 30 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{meas} (m/s)	Error (m/s)	U (k=2) (m/s)
0.983	23.60	23.70	0.7	-0.3	0.18
2.024	23.74	23.70	1.7	-0.3	0.18
3.044	23.50	23.70	2.9	-0.2	0.18
4.119	23.82	23.70	3.9	-0.2	0.19
5.02	23.50	23.70	4.9	-0.2	0.18
5.99	23.88	23.70	5.8	-0.2	0.18
7.08	23.50	23.70	6.9	-0.1	0.20
8.18	23.58	23.70	8.0	-0.2	0.18
9.11	23.50	23.70	9.0	-0.1	0.19
10.08	23.66	23.70	10.0	-0.1	0.25
11.15	23.32	23.70	11.0	-0.2	0.21
12.14	23.66	23.70	12.0	-0.2	0.20
13.20	23.32	23.70	13.2	0.0	0.25
14.25	23.50	23.70	14.9	-0.1	0.27
15.23	23.30	23.70	15.1	-0.2	0.27
16.29	23.40	23.70	16.2	-0.1	0.23

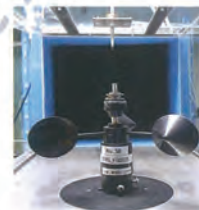
Remark:

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

² Velocity of standard

³ 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

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM MANUFACTURER MODEL/TYPE

: Cup anemometer
: Novallene
: Sensor: WS-02F
Data logger: 110-WS-250L-D

SERIAL NUMBER

: Sensor: WSD-014

ID NUMBER

: Data logger: AS789

CONDITION AS-RECEIVED

: RWG JS0531

CUSTOMER

: Used item
: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

: 16 Jan 2023

MEASUREMENT DATE

: 18 Jan 2023

ISSUE DATE

: 20 Jan 2023

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 : 1010.1 ± 10 hPa

PLACE OF CALIBRATION

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

CALIBRATION CONDITIONS

: Wind tunnel cross-section area 900 cm²
Win direction frontal area 100 cm²
Diameter of mounting pipe 129 mm
Blockage ratio of test object 0.111 [-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.7) °C, (44.5) %RH and (1018.3) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thichai
☐ Miss Jitraporn Lerttongphol

Approved signature:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Inside 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 "m"²

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

CERTIFICATE OF CALIBRATION

Certificate No.: CL-006-66
Page 1 of 2

Equipment Name: Data Logger with Temperature
Sensor
Manufacturer: Novalynx
Model: 110-WS-25DL-D
Serial No.: A5789
ID No.: RYG_FS0531

Customer
Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 16 Jan 2023
Calibration date: 18 Jan 2023
Issue date: 20 Jan 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667882-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591, Due date: 22 July 2023

Calibration Condition
Temperature: (23±3) °C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: *28/Jan*
Mr. Parinya Booncharoen
Calibration Department Manager

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

CERTIFICATE OF CALIBRATION

Calibration No.: RH-06012023
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novalynx
Model/Type : 110-WS-25DL-D
Serial Number : A5789
ID No. : RYG_FS0531
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (26±3)°C, and relative humidity of (50±15)%.

Measurement Method:
Unit Under Calibration (UUC) was calibrated by comparison method with standard thermo hygrometer in the humidity gen-
erator chamber to determine the errors.

Traceability:
This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of
Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number:
20314-101. Due date: Mar 14, 2023.

Measurement Date : Jan 18, 2023
Issue Date : Jan 20, 2023

Measurement Results:
This equipment was connected with indoor air quality probe and Displayed (URI) on display. Model: HMP60, Serial num-
ber: T0210901.
Calibration was performed in the range of 20%RH to 80%RH
The results of calibration are reported in table below.

Determined (%RH)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty ±(%RH)
20	20.03	18.0	-2.0	0.51
50	50.24	47.8	-2.4	0.51
80	80.19	77.3	-2.9	0.51

Performed by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: *28/Jan*
Mr. Parinya Booncharoen
Calibration Department Manager

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

Certificate No.: CL-006-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: T0210901.

Dimension : Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.067	19.8	-0.3	0.099
60	25.058	24.6	-0.5	0.099
60	30.052	29.5	-0.6	0.099
60	35.047	34.5	-0.5	0.099
60	40.038	39.3	-0.7	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



ROTA METER CALIBRATION RESULT JULY 2023

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	03 Jul 23	Y = 1.2484x - 0.6741	0.9931
BKK_FS0579	03 Jul 23	Y = 1.0997x - 0.4918	1.0000
BKK_FS0583	01 Jul 23	Y = 1.0068x + 1.6459	0.9998
BKK_FS0584	01 Jul 23	Y = 0.9804x + 9.469	0.9999
BKK_FS0585	07 Jul 23	Y = 1.0248x + 0.8333	0.9996
BKK_FS0586	01 Jul 23	Y = 0.9907x + 11.074	1.0000
BKK_FS0587	07 Jul 23	Y = 0.986x + 17.77	0.9993
BKK_FS0588	01 Jul 23	Y = 0.9751x + 9.8452	0.9999
BKK_FS0589	03 Jul 23	Y = 1.0174x + 0.0381	1.0000
BKK_FS0590	01 Jul 23	Y = 1.0127x - 3.4333	1.0000
BKK_FS0591	03 Jul 23	Y = 1.0452x - 51.824	0.9998
BKK_FS0592	07 Jul 23	Y = 1.0003x + 14.344	1.0000
BKK_FS0593	01 Jul 23	Y = 1.0386x - 41.415	0.9997
BKK_FS0594	07 Jul 23	Y = 1.0025x + 6.32	0.9999
BKK_FS0595	01 Jul 23	Y = 1.0871x - 114.97	0.9985
BKK_FS0596	03 Jul 23	Y = 1.038x - 51.974	0.9993
BKK_FS0597	01 Jul 23	Y = 1.0059x - 9.9086	1.0000
BKK_FS1004	01 Jul 23	Y = 1.0186x + 6.731	0.9998
BKK_FS1005	01 Jul 23	Y = 0.9922x + 13.993	0.9970
BKK_FS1006	01 Jul 23	Y = 1.1747x - 3.1235	0.9991
BKK_FS1007	07 Jul 23	Y = 1.0737x + 0.8677	0.9997
BKK_FS1008	07 Jul 23	Y = 1.0446x + 1.2156	0.9999
BKK_FS1009	01 Jul 23	Y = 1.1044x - 0.8245	1.0000
BKK_FS1010	03 Jul 23	Y = 1.2271x - 2.0139	1.0000
BKK_FS1011	03 Jul 23	Y = 1.261x - 1.7003	1.0000
BKK_FS1012	03 Jul 23	Y = 0.9978x - 3.7238	0.9990
BKK_FS1013	03 Jul 23	Y = 1.0245x - 28.65	0.9999
BKK_FS1014	01 Jul 23	Y = 1.3135x - 7.0966	0.9961
BKK_FS1015	01 Jul 23	Y = 0.9802x + 3.8214	0.9999
BKK_FS1016	01 Jul 23	Y = 1.0726x - 85.581	0.9995
BKK_FS1020	01 Jul 23	Y = 1.1161x - 1.1986	1.0000
BKK_FS1021	01 Jul 23	Y = 0.9566x + 16.524	0.9987
BKK_FS1022	01 Jul 23	Y = 1.0712x - 89.51	0.9990
BKK_FS1023	01 Jul 23	Y = 1.3791x - 8.7221	0.9944
BKK_FS1024	01 Jul 23	Y = 0.9449x + 11.421	0.9993
BKK_FS1025	01 Jul 23	Y = 1.0477x - 41.116	1.0000
BKK_FS1026	01 Jul 23	Y = 1.3389x - 4.918	1.0000
BKK_FS1027	01 Jul 23	Y = 0.9852x + 1.5238	1.0000
BKK_FS1028	01 Jul 23	Y = 1.0281x - 19.897	0.9996

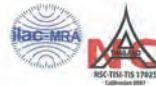


ROTA METER CALIBRATION RESULT JULY 2023

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1029	01 Jul 23	Y = 1.3382x - 8.9776	0.9941
BKK_FS1030	01 Jul 23	Y = 0.9818x + 2.3476	0.9995
BKK_FS1031	01 Jul 23	Y = 1.0526x - 64.415	0.9997
BKK_FS1039	01 Jul 23	Y = 0.998x + 14.823	0.9997
BKK_FS1040	01 Jul 23	Y = 1.0041x - 2.7552	0.9999
BKK_FS1041	01 Jul 23	Y = 1.116x - 1.0078	0.9999
BKK_FS1042	01 Jul 23	Y = 1.0209x + 3.56	0.9980
BKK_FS1043	01 Jul 23	Y = 1.0039x - 5.0143	0.9999
BKK_FS1044	01 Jul 23	Y = 1.0807x + 0.9837	0.9998
BKK_FS1164	03 Jul 23	Y = 1.0589x + 4.6061	0.9996
BKK_FS1165	03 Jul 23	Y = 0.9809x + 7.5262	0.9981
BKK_FS1166	03 Jul 23	Y = 1.0567x - 50.446	0.9999
BKK_FS1200	03 Jul 23	Y = 1.3634x - 1.3816	0.9991
BKK_FS1201	03 Jul 23	Y = 1.0388x - 7.0524	0.9999
BKK_FS1202	03 Jul 23	Y = 1.0518x - 59.531	0.9998
RYG_FS0197	01 Jul 23	Y = 1.0087x - 3.2838	0.9999
RYG_FS0198	01 Jul 23	Y = 0.9877x + 36.487	0.9999
RYG_FS0199	01 Jul 23	Y = 1.0299x - 0.367	0.9992
PHK_FS0027	13 Jul 23	Y = 1.1219x - 2.2432	0.9984
PHK_FS0028	13 Jul 23	Y = 1.0341x - 6.7967	0.9999
PHK_FS0029	13 Jul 23	Y = 0.9977x + 8.7829	0.9999
SGK_FS0135	14 Jul 23	Y = 0.9877x + 11.513	0.9974
SGK_FS0138	13 Jul 23	Y = 1.0571x - 1.1565	0.9991
SGK_FS0139	13 Jul 23	Y = 0.9801x + 8.6267	0.9997
SGK_FS0140	13 Jul 23	Y = 0.9978x + 11.644	1.0000
SGK_FS0141	13 Jul 23	Y = 1.1349x - 2.2867	0.9990
SGK_FS0142	13 Jul 23	Y = 0.9915x + 11.403	0.9994
SGK_FS0143	13 Jul 23	Y = 1.0054x - 4.0648	1.0000

Review By :
(Mr. Wichan Choonharat)
Enviro Field Services Manager

Approved By :
(Mr. Sarayuth Jitranont)
Assistant General Manager



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06230441
Issued Date: 19 September 2023
Job No.: WO-00005382
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
618/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature 23.9 °C ± 0.2
Humidity 85.3 %RH ± 1.4

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) (Wet Chemistry)
618/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Nattapat Rungreang
Calibration Date: 18 September 2023
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Stama 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. Nattapat Rungreang)
Person in charge

(Mr. Nitinun Srihawan)
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.

2533 สุขุมวิท ถนนสุขุมวิท กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441

Page 2 of 3

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	418.3	0.31	0.13	
536.66	536.6	0.06	0.13	
637.98	638.3	-0.32	0.13	
748.48	748.7	-0.22	0.13	
807.03	807.4	-0.37	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.289	0.0040	0.0045
	0.5168	0.519	-0.0022	0.0045
	1.0298	1.029	0.0008	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.283	0.0037	0.0045
	0.5073	0.509	-0.0017	0.0045
	1.0083	1.007	0.0013	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.250	0.0016	0.0045
	0.4595	0.462	-0.0025	0.0045
	0.9334	0.933	0.0004	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.245	0.0011	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.946	0.0008	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	1.002	0.0012	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.257	0.0009	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.971	0.0010	0.0045

2533 สุขุมวิท ถนนสุขุมวิท กรุงเทพมหานคร 10260
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Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441

Page 3 of 3

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	0.737	-0.0015	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	1.3	1.886	
391.44 +/- 0.11 nm	391.4	1.3	1.886	
Spectral Resolution *				
Nominal Concentration 0.02 % w/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.66	266.69	1.38	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4566	0.2780		
Absorbance (A)	0.413	0.300		

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

The End of Certificate

2533 สุขุมวิท ถนนสุขุมวิท กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00005382

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
18 Sep 2023			18 Sep 2023		
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 (เช็ดได้ทั่วบ้าง, ภายในนอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ควบคุมเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	*
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	9.2 Hours
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	741.5 Hours
<input type="checkbox"/>	<input type="checkbox"/>	11. จอจัดหลายตัวอ้อมบ้าง (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. ระดับการละลายใน 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 ไมล์กัน 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"/>	

เงื่อนไข/ข้อแนะนำ: *656.1nm=656.1nm

*486.0nm=485.5nm

Mr.Nattapat Rungreang
Service Engineerบริษัท ดีเคเอส เอเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Phone: +66 2099 1200 Email: info.asia@dksh.com Website: www.dksh.com/asia/thailand

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CAL-FM-R31-03: 20 Jul 2022

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACC23005
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No.: 35002736
ID No.: RYG_FS0496

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 17 JANUARY 2023
Date of Issue : 19 JANUARY 2023

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.

BUL - EN0069

REVIEW BY: Autcharawan S.
 APPROVED BY: Srinat M.
 NEXT CAL DATE: 12 Jan 24

Certificate of Calibration
ICS-2100: Anion (ID#659)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co., Ltd.

ICS-2100 S/N: 15010977
AS-HV S/N: 5450A36659

For
ALS Laboratory Group (Thailand) Co., Ltd.

Operator Signature: *Nutdanai Laekhwan* Date: Jan 12, 2023
(Mr.Nutdanai Laekhwan)
Application Chemist

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC23005
Job No. : VC66AC0024
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

T. Petchurai

Cert. No. : ACC23005
Job No. : VC66AC0024
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.98	-0.02	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
0.35	0.10	3.0

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

End of Calibration Certificate

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23249
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734218 / 146937 / 34368
ID No. : RYG_FS0031

Condition As Found : GOOD

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

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

Received Date : 13 JULY 2023
Calibration Date : 10 AUGUST 2023
Date of Issue : 11 AUGUST 2023

REVIEW BY : *Nathakorn P.*
APPROVED BY : *Thanakul P.*
NEXT CAL. DATE : 10/8/24

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

QF-TS12-04-04-020664

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-3002-23	14-FEB-24

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. : ACL23249
Job No. : VC66AC0085
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.3

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

Frequency Weighting	Measured value (dB)
A - weight	14.8
C - weight	19.7
Flat	25.7

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	0.8	0.8	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.2	0.3	0.3	±5.0

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
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)
Auto	94.0	94.0	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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23249
Job No. : VC66AC0085
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency 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

QF-TS12-04-04-020664



451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACC23009
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178121
ID No. : RYG_FS0213

Condition As Found : GOOD

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

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

Received Date : 24 JANUARY 2023
Calibration Date : 26 JANUARY 2023
Date of Issue : 27 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

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

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC23009
Job No. : VC66AC0031
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC23009
Job No. : VC66AC0031
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.16	0.16	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.2	0.3	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.97	0.10	3.0

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

End of Calibration Certificate

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthon Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23008
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122578 / 143486 / 22620
ID No.: RYG FS0017

Condition As Found : GOOD

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

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

Received Date : 14 DECEMBER 2022
Calibration Date : 03-05 JANUARY 2023
Date of Issue : 06 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23008
Job No. : VC66AC0021
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial.No.	Cert.No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23008
Job No. : VC66AC0021
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23008
Job No. : VC66AC0021
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.1

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

Frequency Weighting	Measured value (dB)
A-weight	16.6
C-weight	22.6
Flat	28.1

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.6	0.7	0.7	± 5.0

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T. Petchurai

QF-TS12-04-04-020664

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Cert. No. : ACL23008
Job No. : VC66AC0021
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	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Cert. No. : ACL23008
Job No. : VC66AC0021
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

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7. Petch.

Cert. No. : ACL23008
Job No. : VC66AC0021
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)
Auto	94.0	94.0	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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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7. Petch.

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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

QF-TS12-04-04-020664

7. Petch.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23009
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,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND,

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

Received Date : 14 DECEMBER 2022
Calibration Date : 03-05 JANUARY 2023
Date of Issue : 06 JANUARY 2023



Calibrated by : Nathakorn Pisutpaisan

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	20.1
Flat	26.6

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.0	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.1	0.1	0.1	± 5.0

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Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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P.T.

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
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	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	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	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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P.T.

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
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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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	107.9	-0.1	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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P.T.

Continuation of Calibration Certificate

Cert. No. : ACL23009
Job No. : VC66AC0021
Pages : 8 of 8

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

QF-TS12-04-04-020664

P.T.

Cert. No. : ACL23046
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,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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Cert. No. : ACL23046
Job No. : VC66AC0024
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

Cert. No. : ACL23046
Job No. : VC66AC0024
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

QF-TS12-04-04-020664

Cert. No. : ACL23046
Job No. : VC66AC0024
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.7

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

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	16.5
Flat	22.4

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.6	0.6	0.6	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-2.3	-2.3	-2.3	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23046
Job No. : VC66AC0024
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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	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	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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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23046
Job No. : VC66AC0024
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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	104.1	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	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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T. Petch

Continuation of Calibration Certificate

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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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petch

Continuation of Calibration Certificate

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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.7	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

QF-TS12-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sidinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23047
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222716 / 143832 / 22763
ID No.: RYG_FS0020

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL23047
Job No. : VC66AC0024
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23047
Job No. : VC66AC0024
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23047
Job No. : VC66AC0024
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.9
Flat	23.8

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.3	-1.2	-1.2	± 5.0

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Cert. No. : ACL23047
Job No. : VC66AC0024
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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> P.T.N.

Cert. No. : ACL23047
Job No. : VC66AC0024
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	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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> P.T.N.

Cert. No. : ACL23047
Job No. : VC66AC0024
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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	107.9	-0.1	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.4	-1.0	±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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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> P.T.N.

Cert. No. : ACL23047
Job No. : VC66AC0024
Pages : 8 of 8

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

QF-TS12-04-04-020664

> P.T.N.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Srinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
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Cert. No. : ACL23086
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222723 / 143841 / 22770
ID No.: RYG_FS0022

Condition As Found : GOOD

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

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

Received Date : 24 JANUARY 2023
Calibration Date : 25-26 JANUARY 2023
Date of Issue : 27 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0263	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0263	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0263	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.5	0.5	0.6	± 1.5
1000	0.0	-0.1	-0.1	± 1.0
8000	-0.1	0.0	0.0	±5.0

QF-TS12-04-04-020664

Cert. No. : ACL23086
Job No. : VC66AC0031
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	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	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Petch.

Cert. No. : ACL23086
Job No. : VC66AC0031
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

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T. Petch.

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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)
Auto	94.0	94.0	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
	200	800	128.0	128.0	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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±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	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petch.

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11. Overload indication

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

12. High level stability

Frequency 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

QF-TS12-04-04-020664

T. Petch.



Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222724 / 143842 / 22771
ID No.: RYG_FS0023

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

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.

QF-TS12-04-04-020664

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP, 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP, 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

QF-TS12-04-04-020664

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Measured value (dB)
A-weight	11.2
C-weight	17.6
Flat	23.4

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.2	0.2	0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.8	-0.8	-0.7	± 5.0

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Job No. : VC66AC0024
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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	-0.1	-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	0.0	±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	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	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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P.T.A.

Cert. No. : ACL23048
Job No. : VC66AC0024
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	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	29.9	-0.1	± 1.1
29.0	28.8	-0.2	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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P.T.A.

Cert. No. : ACL23048
Job No. : VC66AC0024
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)
Auto	94.0	94.0	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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

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

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P.T.A.

Cert. No. : ACL23048
Job No. : VC66AC0024
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.1	±1.5
89.6	89.7		

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

QF-TS12-04-04-020664

P.T.A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirdinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22295
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 144835 / 23230
ID No.: RYG_FS0024

Condition As Found : GOOD

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

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

Received Date : 07 DECEMBER 2022
Calibration Date : 16-20 DECEMBER 2022
Date of Issue : 21 DECEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
19.3

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

Frequency Weighting	Measured value (dB)
A - weight	14.8
C - weight	20.6
Flat	26.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.1	-0.1	-0.1	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	0.3	0.4	0.4	±5.0

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T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±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	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

S. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

QF-TS12-04-04-020664

S. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
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)
Auto	94.0	94.0	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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.6	-0.8	±3.0

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

QF-TS12-04-04-020664

S. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22295
Job No. : VC66AC0016
Pages : 8 of 8

11. Overload indication

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

QF-TS12-04-04-020664

S. Petch

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirdinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
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Cert. No. : ACL23077
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_FS0025

Condition As Found : GOOD

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

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

Received Date : 24 JANUARY 2023
Calibration Date : 25-26 JANUARY 2023
Date of Issue : 27 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	-0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.1
Flat	22.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.0	-0.9	-0.8	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	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	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	27.9	-0.1	± 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

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C sound level

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

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23077
Job No. : VC66AC0031
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.7	0.2	±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

QF-TS12-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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Cert. No. : ACL23038
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21/ Microphone UC-52 / Preamplifier NH-21
Serial No.: 00465461 / 108081 / 19513
ID No.: RYG_FS0007

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurui
(Thanakul Petchurui)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	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	✓	-	0.4	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	-	-	-	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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.5

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

Frequency Weighting	Measured value (dB)
A-weight	22.2
C-weight	21.6
Flat	22.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.1	0.2	0.2	± 5.0

QF-TS12-04-04-020664

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 5 of 9

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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	-0.1	-0.1	0.0	±2.0
125	-0.1	-0.1	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	-0.1	-0.1	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.1	0.0	±2.0
4000	0.1	0.0	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. B. T. A.

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1

QF-TS12-04-04-020664

T. B. T. A.

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 7 of 9

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	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	43.0	43.0	0.0	±0.5
120	33.0	32.6	-0.4	±0.5

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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

QF-TS12-04-04-020664

T. B. T. A.

Cert. No. : ACL23038
Job No. : VC66AC0024
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.9	-0.5	±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	-
Positive half cycle	135.4	135.0	-0.4	±2.0
Negative half cycle	135.4	135.0	-0.4	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.4	89.3	-0.1	±1.5

QF-TS12-04-04-020664

T. B. T. A.

Continuation of Calibration Certificate

Cert. No. : ACL23038
Job No. : VC66AC0024
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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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP, 03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL-BP, 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.comCert. No. : ACL22296
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21 / Microphone UC-52 / Preamplifier NH-21
Serial No. : 00376364 / 71486 / 23142
ID No. : RYG_FS0012

Condition As Found : GOOD

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

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

Received Date : 07 DECEMBER 2022
Calibration Date : 16-20 DECEMBER 2022
Date of Issue : 21 DECEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurui)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

QF-TS12-04-04-020664

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
24.0

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

Frequency Weighting	Measured value (dB)
A - weight	22.2
C - weight	21.9
Flat	21.6

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	0.0	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.2	0.4	0.4	±5.0

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 5 of 9

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	-0.2	0.0	0.0	±2.0
125	-0.1	0.0	0.0	±1.5
250	-0.1	0.0	0.0	±1.5
500	-0.1	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.1	±3.0
8000	0.0	0.2	0.2	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.1	0.1	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	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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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 7 of 9

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	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	43.0	43.0	0.0	±0.5
120	33.0	33.0	0.0	±0.5

9. Tone burst response

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±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	-
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	Value (dB)	Limits (dB)
89.4	89.2		
		-0.2	±1.5

QF-TS12-04-04-020664

T. Petchurani

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.comCert. No. : ACL23045
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900074 / 188467 / 01736
ID No.: RYG_FS0495

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurani
(Thanakul Petchurani)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22296
Job No. : VC66AC0016
Pages : 9 of 9

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

QF-TS12-04-04-020664

T. Petchurani

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchurani

Cert. No. : ACL23045
Job No. : VC66AC0024
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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	-	-	-	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

QF-TS12-04-04-020664

P. T. L.

Cert. No. : ACL23045
Job No. : VC66AC0024
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	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	Measured value (dB)
A - weight	9.9
C - weight	16.8
Flat	22.8

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.4	0.4	0.4	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-2.0	-1.9	-1.9	±5.0

QF-TS12-04-04-020664

P. T. L.

Cert. No. : ACL23045
Job No. : VC66AC0024
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	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	-0.1	-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	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

P. T. L.

Cert. No. : ACL23045
Job No. : VC66AC0024
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	137.1	0.1	± 1.1
136.0	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.1	0.1	± 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	109.1	0.1	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

QF-TS12-04-04-020664

P. T. L.

Cert. No. : ACL23045
Job No. : VC66AC0024
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)
Auto	94.0	94.0	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	128.0	0.0	±1.0

10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

r. P. Th.

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd., Bangumru, Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23073
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00920831 / 22191 / 22220
ID No.:

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 23-24 JANUARY 2023
Date of Issue : 25 JANUARY 2023

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.

QF-TS12-04-04-020664

Cert. No. : ACL23045
Job No. : VC66AC0024
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency 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

QF-TS12-04-04-020664

r. P. Th.

Cert. No. : ACL23073
Job No. : VC66AC0029
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments. For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP, 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP, 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

r. P. Th.

Continuation of Calibration Certificate

Cert. No. : ACL23073
Job No. : VC66AC0029
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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. If high level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

7. Reth

Continuation of Calibration Certificate

Cert. No. : ACL23073
Job No. : VC66AC0029
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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.1	0.0	0.1	±1.0
125	0.0	0.1	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

7. Reth

Continuation of Calibration Certificate

Cert. No. : ACL23073
Job No. : VC66AC0029
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.0

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

Frequency Weighting	Measured value (dB)
A - weight	9.8
C - weight	14.6
Flat	20.3

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.0	0.0	0.0	± 1.0
1000	0.1	0.1	0.1	± 0.7
8000	-0.3	-0.2	-0.1	+ 1.5, - 2.5

QF-TS12-04-04-020664

7. Reth

Continuation of Calibration Certificate

Cert. No. : ACL23073
Job No. : VC66AC0029
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

QF-TS12-04-04-020664

7. Reth

Cert. No. : ACL23073
Job No. : VC66AC0029
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.7	-0.7	±2.0

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	-
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

QF-TS12-04-04-020664

T. Petchur

Rev. 1.00

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd., Bangbunmu, Bangkok Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23074
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00920832 / 22192 / 22221
ID No.: -

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 23-24 JANUARY 2023
Date of Issue : 25 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Cert. No. : ACL23073
Job No. : VC66AC0029
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

Cert. No. : ACL23074
Job No. : VC66AC0029
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL23074
Job No. : VC66AC0029
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23074
Job No. : VC66AC0029
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.3

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.3
Flat	19.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	± 1.0
1000	0.1	0.1	0.1	± 0.7
8000	-0.5	-0.5	-0.4	+ 1.5, - 2.5

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23074
Job No. : VC66AC0029
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23074
Job No. : VC66AC0029
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	27.0	0.0	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

QF-TS12-04-04-020664

T. Petch.

Cert. No. : ACL23074
Job No. : VC66AC0029
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)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±2.0

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	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd.,Bangbunmu, Bangkok Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23075
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00920833 / 22193 / 22222
ID No.:

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 23-24 JANUARY 2023
Date of Issue : 25 JANUARY 2023

Calibrated by : Nathakorn Pisutpoisan

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.

QF-TS12-04-04-020664

Cert. No. : ACL23074
Job No. : VC66AC0029
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchurai

Cert. No. : ACL23075
Job No. : VC66AC0029
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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

QF-TS12-04-04-020664

T. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
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	-0.1	0.0	-0.1	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.1

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.2
Flat	19.7

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	0.1	0.1	0.1	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	-0.3	-0.3	-0.3	+ 1.5, - 2.5

QF-TS12-04-04-020664

T. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

QF-TS12-04-04-020664

T. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
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)
Auto	94.0	94.0	0.0	±0.8

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

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	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±2.0

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	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

S. Petchurai

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd., Bangbunru, Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23076
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00920834 / 22194 / 22223
ID No.: -

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 23-24 JANUARY 2023
Date of Issue : 25 JANUARY 2023

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.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23075
Job No. : VC66AC0029
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

S. Petchurai

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23076
Job No. : VC66AC0029
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP, 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP, 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

S. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL23076
Job No. : VC66AC0029
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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

QF-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL23076
Job No. : VC66AC0029
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.6
Flat	20.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.1	0.1	0.1	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	-0.2	-0.1	-0.1	+ 1.5, - 2.5

QF-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL23076
Job No. : VC66AC0029
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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	-0.1	-0.1	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	0.0	-1.3	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL23076
Job No. : VC66AC0029
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	137.1	0.1	±0.8
136.0	136.1	0.1	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

QF-TS12-04-04-020664

T. Reth.

Cert. No. : ACL23076
Job No. : VC66AC0029
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)
Auto	94.0	94.0	0.0	±0.8

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±2.0

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	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23087
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No. : 01120936 / 21737 / 22325
ID No. : -

Condition As Found : GOOD

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

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

Received Date : 24 JANUARY 2023
Calibration Date : 26-30 JANUARY 2023
Date of Issue : 31 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchur)

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

QF-TS12-04-04-020664

Cert. No. : ACL23076
Job No. : VC66AC0029
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.1	±1.5
89.6	89.7		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
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	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+1.5, -2.5
16000	0.0	-1.3	-1.2	+2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.4
Flat	19.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	± 1.0
1000	0.0	0.0	0.0	± 0.7
8000	-0.7	-0.7	-0.7	+1.5, -2.5

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
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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	137.1	0.1	±0.8
136.0	136.1	0.1	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.1	0.1	±0.8
132.0	132.1	0.1	±0.8
131.0	131.0	0.0	±0.8
129.0	129.1	0.1	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.1	0.1	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	27.0	0.0	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23087
Job No. : VC66AC0030
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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)
Auto	94.0	94.0	0.0	±0.8

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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±2.0

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	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

T. Petchuraj

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23088
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No. : 01120937 / 21845 / 22326
ID No. : -

Condition As Found : GOOD

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

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

Received Date : 24 JANUARY 2023
Calibration Date : 26-30 JANUARY 2023
Date of Issue : 31 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchuraj
(Thanakul Petchuraj)

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

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Continuation of Calibration Certificate

Cert. No. : ACL23087
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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	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchuraj

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23088
Job No. : VC66AC0030
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments. For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

QF-TS12-04-04-020664

T. Petchuraj

Summary of Measurement Result :

Parameter	Pass	Fail	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

QF-TS12-04-04-020664

S. Petch

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

QF-TS12-04-04-020664

S. Petch

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	14.9
Flat	20.4

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	0.1	0.1	0.1	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	-0.4	-0.4	-0.4	+ 1.5, - 2.5

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S. Petch

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.1	0.1	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

QF-TS12-04-04-020664

S. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23088
Job No. : VC66AC0030
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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)
Auto	94.0	94.0	0.0	±0.8

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±2.0

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	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23196
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734223 / 169439 / 72460
ID No. : RYG_FS0029

Condition As Found : GOOD

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

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

Received Date : 15 JUNE 2023
Calibration Date : 20-22 JUNE 2023
Date of Issue : 23 JUNE 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23088
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	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	±0.1

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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).

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.1	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	-	-	-	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

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
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	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
1eq	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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.3

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.0
Flat	22.8

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	0.0	0.0	0.0	± 1.0
8000	-2.1	-2.1	-2.1	±5.0

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
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)
Auto	94.0	94.0	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	128.0	0.0	±1.0

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	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±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

QF-TS12-04-04-020664

T. Petch

63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Walthapa, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No. : CL-044-66
Page 1 of 2Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 20032242
ID No: RYG_FS0522Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.Received date: 21 Feb 2023
Calibration date: 24 Feb 2023
Issue date: 28 Feb 2023Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No: 667682-08, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1009-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (55±15)%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-0034-22, Certificate number: ER-0092-
22Calibrated by
□ Mr. Sorawit Thachalad
□ Miss Jitraporn LertsompholApproved Signatory: Mr. Parinya Booncharoen
Calibration Department Manager

Continuation of Calibration Certificate

Cert. No. : ACL23196
Job No. : VC66AC0066
Pages : 8 of 8

11. Overload indication

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

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

QF-TS12-04-04-020664

T. Petch

63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Walthapa, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.comCertificate No. : CL-044-66
Page 2 of 2Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20 ~ 40 °C
Function:Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001206.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.046	20.0	0.0	0.099
60	25.056	25.0	-0.1	0.099
60	30.055	30.1	0.0	0.099
60	35.048	35.1	0.1	0.099
60	40.043	40.1	0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001796.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.046	20.2	0.2	0.099
70	25.055	25.0	-0.1	0.099
70	30.055	29.9	-0.2	0.099
70	35.048	34.8	-0.2	0.099
70	40.044	39.7	-0.3	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001250.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.046	20.0	0.0	0.099
110	25.056	25.0	-0.1	0.099
110	30.055	30.1	0.0	0.099
110	35.048	35.1	0.1	0.099
110	40.043	40.1	0.1	0.099

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CDT-036-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 22016391
ID No: RYG_FS0581

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 11 Jul 2023
Calibration date: 20 Jul 2023
Issue date: 20 Jul 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

Temperature: (23±3) °C
Relative Humidity: (55±15)%

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0038-23, Certificate number: ER-0092-
22

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0038-23, Certificate number: ER-0092-
22

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

Calibrated by

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



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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

CERTIFICATE OF CALIBRATION

Certificate No.: CL-015-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 18018314
ID No: RYG_FS0359

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 23 Jan 2023
Calibration date: 02 Feb 2023
Issue date: 06 Feb 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

Temperature: (23±3) °C
Relative Humidity: (55±15)%

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0034-22, Certificate number: ER-0092-
22

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0034-22, Certificate number: ER-0092-
22

REVIEW BY *Parinya P*
APPROVED BY *Parinya P*
NEXT CAL DATE 2/2/24

Calibrated by

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate No.: CDT-036-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025583.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.053	19.9	-0.2	0.099
80	25.050	24.9	-0.2	0.099
80	30.045	29.9	-0.1	0.099
80	35.038	34.8	-0.2	0.099
80	40.030	39.8	-0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023943.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.053	20.0	-0.1	0.099
110	25.051	25.0	-0.1	0.099
110	30.045	30.0	0.0	0.099
110	35.038	35.0	0.0	0.099
110	40.030	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025054.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.053	20.0	-0.1	0.099
75	25.051	24.9	-0.2	0.099
75	30.045	29.8	-0.2	0.099
75	35.038	34.8	-0.2	0.099
75	40.030	39.7	-0.3	0.099

UUC* : Unit Under Calibration

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

* End of Certificate *



Certificate No.: CL-015-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021465.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.061	20.0	-0.1	0.099
80	25.048	25.0	0.0	0.099
80	30.045	30.0	0.0	0.099
80	35.030	35.0	0.0	0.099
80	40.021	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021262.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.062	20.1	0.0	0.099
70	25.048	24.9	-0.1	0.099
70	30.040	29.9	-0.1	0.099
70	35.032	34.8	-0.2	0.099
70	40.021	39.8	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20008280.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.060	20.0	-0.1	0.099
110	25.050	25.1	0.1	0.099
110	30.039	30.1	0.1	0.099
110	35.032	35.1	0.1	0.099
110	40.022	40.1	0.1	0.099

UUC* : Unit Under Calibration

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

* End of Certificate *



CERTIFICATE OF CALIBRATION

Certificate No. : CL-017-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 15006715
ID No: RYG_FS0220

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 23 Jan 2023
Calibration date: 03 Feb 2023
Issue date: 06 Feb 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22

REVIEW BY *Natani P.*
APPROVED BY *Act*
NEXT CAL DATE *3/3/24*

Calibrated by
☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory: *Mr. Parinya Booncharoen*
Calibration Department Manager

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 17022563.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.062	20.0	-0.1	0.099
60	25.054	25.0	-0.1	0.099
60	30.048	30.0	0.0	0.099
60	35.034	35.0	-0.1	0.16
60	40.019	39.9	-0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015507.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.061	20.2	0.1	0.099
70	25.053	25.1	0.0	0.099
70	30.043	30.0	0.0	0.099
70	35.031	35.0	0.0	0.099
70	40.014	39.9	-0.1	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20019632.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.061	20.0	-0.1	0.099
110	25.055	25.1	0.0	0.099
110	30.054	30.1	0.0	0.10
110	35.033	35.1	0.1	0.099
110	40.011	40.1	0.1	0.099

UUC* : Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-033-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 22016388
ID No: RYG_FS0578

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 11 Jul 2023
Calibration date: 20 Jul 2023
Issue date: 20 Jul 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0038-23, Certificate number: ER-0092-
22

REVIEW BY *Natani P.*
APPROVED BY *Act*
NEXT CAL DATE *20/9/24*

Calibrated by
☒ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved Signatory: *Mr. Parinya Booncharoen*
Calibration Department Manager

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22015694.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.034	19.9	-0.1	0.099
80	25.052	24.9	-0.2	0.099
80	30.043	29.9	-0.1	0.099
80	35.036	34.9	-0.1	0.099
80	40.035	39.8	-0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023956.
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.034	20.1	0.1	0.099
110	25.051	25.1	0.0	0.099
110	30.043	30.1	0.1	0.099
110	35.036	35.1	0.1	0.099
110	40.035	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025031.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.034	20.1	0.1	0.099
75	25.051	25.0	-0.1	0.099
75	30.043	29.9	-0.1	0.099
75	35.037	34.8	-0.2	0.099
75	40.035	39.7	-0.3	0.099

UUC* : Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CL-036-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 15006714
ID No: RYG_FS0219

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 07 Feb 2023
Calibration date: 14 Feb 2023
Issue date: 14 Feb 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3) °C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22

REVIEW BY: *Parinya P.*
APPROVED BY: *Parinya P.*
EFFECTIVE DATE: 14/2/24

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: *Parinya P.*
Mr. Parinya Booncharoen
Calibration Department Manager

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Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22035263.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.062	20.4	0.3	0.099
60	25.060	25.4	0.3	0.099
60	30.051	30.4	0.3	0.099
60	35.050	35.4	0.3	0.099
60	40.048	40.4	0.4	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015491.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.062	20.5	0.4	0.099
70	25.060	25.3	0.2	0.099
70	30.051	30.2	0.1	0.099
70	35.050	35.1	0.0	0.099
70	40.048	40.1	0.1	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 17023217.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.062	20.3	0.2	0.099
110	25.060	25.3	0.2	0.099
110	30.051	30.3	0.2	0.099
110	35.050	35.3	0.2	0.099
110	40.048	40.3	0.3	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CDT-035-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 22016390
ID No: RYG_FS0580

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 11 Jul 2023
Calibration date: 20 Jul 2023
Issue date: 20 Jul 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3) °C
Relative Humidity: (55±15)%

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-0038-23, Certificate number: ER-0092-
22

REVIEW BY: *Parinya P.*
APPROVED BY: *Parinya P.*
EFFECTIVE DATE: 20/7/24

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

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpal Phoommit



Approved Signatory: *Parinya P.*
Mr. Parinya Booncharoen
Calibration Department Manager

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025580.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.053	20.0	-0.1	0.099
80	25.050	25.0	-0.1	0.099
80	30.043	30.0	0.0	0.099
80	35.038	35.0	0.0	0.099
80	40.031	39.9	-0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023942.
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.053	20.1	0.0	0.099
110	25.050	25.1	0.0	0.099
110	30.043	30.1	0.1	0.099
110	35.038	35.0	0.0	0.099
110	40.031	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025040.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.054	20.1	0.0	0.099
75	25.050	25.0	-0.1	0.099
75	30.043	29.9	-0.1	0.099
75	35.038	34.8	-0.2	0.099
75	40.031	39.8	-0.2	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CL-047-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 15006726
ID No: RYG_FS0226

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 21 Feb 2023
Calibration date: 27 Feb 2023
Issue date: 28 Feb 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (65±15)%

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-0034-22, Certificate number: ER-0092-
22



Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-018-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 15006718
ID No: RYG_FS0223

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

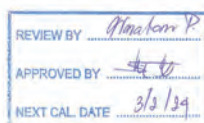
Received date: 23 Jan 2023
Calibration date: 03 Feb 2023
Issue date: 06 Feb 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (65±15)%

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-0034-22, Certificate number: ER-0092-
22



Calibrated by
☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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Certificate No.: CL-047-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15015841.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.052	20.0	-0.1	0.099
60	25.058	25.0	-0.1	0.099
60	30.055	30.0	-0.1	0.099
60	35.049	35.0	0.0	0.099
60	40.041	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015494.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.052	20.2	0.1	0.099
70	25.058	25.0	-0.1	0.099
70	30.055	29.9	-0.2	0.099
70	35.048	34.8	-0.2	0.099
70	40.041	39.7	-0.3	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20008282.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.0	-0.1	0.099
110	25.058	25.1	0.0	0.099
110	30.055	30.1	0.0	0.099
110	35.048	35.1	0.1	0.099
110	40.041	40.1	0.1	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



Certificate No.: CL-018-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18009588.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.062	20.1	0.0	0.099
60	25.054	25.1	0.0	0.099
60	30.042	30.1	0.1	0.099
60	35.031	35.1	0.0	0.14
60	40.014	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015496.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.062	20.2	0.1	0.099
70	25.053	25.2	0.1	0.099
70	30.042	30.1	0.1	0.099
70	35.029	35.1	0.1	0.099
70	40.016	40.0	0.0	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20019638.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.062	20.2	0.1	0.099
110	25.053	25.2	0.1	0.099
110	30.042	30.2	0.2	0.099
110	35.031	35.3	0.3	0.099
110	40.013	40.3	0.3	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No. : CL-057-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 15006716
ID No: RYG_FS0221

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 01 Mar 2023
Calibration date: 14 Mar 2023
Issue date: 15 Mar 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22

REVIEW BY	<i>Piranya P.</i>
APPROVED BY	<i>Mr. P.</i>
NEXT CAL DATE	14/3/24

Calibrated by
☒ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: *Mr. P.*
Mr. Piranya Booncharoen
Calibration Department Manager

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CERTIFICATE OF CALIBRATION

Certificate No. : CL-016-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 18018316
ID No: RYG_FS0360

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 23 Jan 2023
Calibration date: 03 Feb 2023
Issue date: 05 Feb 2023

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition
Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22

REVIEW BY	<i>Piranya P.</i>
APPROVED BY	<i>Mr. P.</i>
NEXT CAL DATE	9/2/24

Calibrated by
☒ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: *Mr. P.*
Mr. Piranya Booncharoen
Calibration Department Manager

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Certificate No. : CL-057-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18009587.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.068	20.1	0.0	0.099
60	25.060	25.1	0.0	0.14
60	30.050	30.0	0.0	0.099
60	35.041	35.0	0.0	0.099
60	40.045	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015492.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.068	20.3	0.2	0.099
70	25.060	25.1	0.0	0.099
70	30.050	30.0	0.0	0.099
70	35.041	34.9	-0.1	0.099
70	40.046	39.8	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 15015967.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.068	20.0	-0.1	0.099
110	25.061	25.0	-0.1	0.099
110	30.050	30.0	0.0	0.099
110	35.041	35.0	0.0	0.099
110	40.046	40.0	0.0	0.099

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

★ End of Certificate ★



Certificate No. : CL-016-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021471.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.061	20.0	-0.1	0.099
60	25.053	25.0	-0.1	0.099
60	30.042	30.0	0.0	0.099
60	35.029	35.0	0.0	0.099
60	40.014	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021266.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.062	20.1	0.0	0.099
70	25.053	25.0	-0.1	0.099
70	30.043	30.0	0.0	0.099
70	35.030	34.9	-0.1	0.099
70	40.015	39.9	-0.1	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 18020502.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.1	0.0	0.099
110	25.053	25.1	0.0	0.099
110	30.044	30.1	0.1	0.099
110	35.029	35.1	0.1	0.099
110	40.017	40.1	0.1	0.099

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No. : CL-045-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 20032243
ID No: RYG_FS0523

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 21 Feb 2023
Calibration date: 27 Feb 2023
Issue date: 28 Feb 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591, Due date: 22 July 2023

Calibration Condition

Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22



Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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BEEN OBTAINED IN WRITING FROM THE LABORATORY.

CERTIFICATE OF CALIBRATION

Certificate No. : CL-046-66
Page 1 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Delta OHM
Model: HD32.2
Serial No: 20032249
ID No: RYG_FS0524

Customer
Name: ALS laboratory group (thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 21 Feb 2023
Calibration date: 24 Feb 2023
Issue date: 28 Feb 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591, Due date: 22 July 2023

Calibration Condition

Temperature: (23±3)°C
Relative Humidity: (55±15)%

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-0034-22, Certificate number: ER-0092-
22



Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate No. : CL-045-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001219.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.069	19.9	-0.2	0.099
60	25.058	25.0	-0.1	0.099
60	30.051	30.0	-0.1	0.099
60	35.047	35.0	0.0	0.099
60	40.040	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001786.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.068	20.2	0.1	0.099
70	25.058	25.1	0.0	0.099
70	30.051	30.0	-0.1	0.099
70	35.047	35.0	0.0	0.099
70	40.040	39.9	-0.1	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001243.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.068	20.0	-0.1	0.099
110	25.058	25.0	-0.1	0.099
110	30.051	30.1	-0.1	0.099
110	35.047	35.1	0.1	0.099
110	40.040	40.1	0.1	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



Certificate No. : CL-046-66
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001215.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.065	20.2	0.1	0.099
60	25.061	25.2	0.1	0.099
60	30.054	30.2	0.1	0.099
60	35.045	35.2	0.2	0.099
60	40.045	40.2	0.2	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001785.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.064	20.1	0.0	0.099
70	25.061	25.0	-0.1	0.099
70	30.053	29.9	-0.2	0.099
70	35.045	34.9	-0.1	0.099
70	40.045	39.8	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001244.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.065	20.0	-0.1	0.099
110	25.061	25.0	-0.1	0.099
110	30.054	30.0	-0.1	0.099
110	35.045	35.0	0.0	0.099
110	40.045	40.0	0.0	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★





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



Certificate of Calibration

Certificate No.: 23PH183
Page: 1 of 2

Equipment: Lux Meter
Manufacturer: TENMARS
Model: TM-201L
Serial No.: 200300974
ID No.: RYG_FS0474
Condition As-Received: Used Item
Received Date: 31 March 2023
Calibration Date: 04 April 2023

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

Reference: 2303-1129WSC Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-PH01 by measuring against
luminous-intensity standard lamp (source-based method) According to the inverse square law measurement
method.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encoder	LMguide 9,6 m	120RC003	DL-0064-22	20 Jul 2025
2) Luminous intensity standard lamp	OL FEL-U	F-1543	TP-1022-22	01 May 2023

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

3. Test Equipment: Programmable Voltage/Current Source (Model: OL83A, S/N: 16221394).

4. Test Equipment: Illuminance Meter (Model: 51002, S/N: 080129).

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

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

-National Institute of Metrology Thailand (NIMT)

REVIEW BY *Mingkearn P.*
APPROVED BY *h.k.*
NEXT CAL. DATE *9/9/24*

Calibrated by: Nival Nitas
Issue Date: 07 April 2023

Approved Signatory: *[Signature]*
☐ Phalinee Prabpaijal
☐ Chatchawan Khunpluek
☒ Nuntawat Khamchai

B 0312475



Cert. No.: 23PH183
Page: 2 of 2

Result of calibration:-

Function: Illuminance Measurement		Range: 200 lx	
<u>Standard Value</u>	<u>UUC* Reading</u>	<u>Error</u>	<u>Uncertainty</u>
(lx)	(lx)	(lx)	(± lx)
0	0.0	0.0	0.060
20	20.0	0.0	0.53
50	50.0	0.0	1.3
100	100.0	0.0	2.6
150	150.0	0.0	3.9
190	190.0	0.0	5.0

Function : Illuminance Measurement		Range :	2000	lx
Standard Value	UUC* Reading	Error	Uncertainty	
(lx)	(lx)	(lx)	(± lx)	
200	200	0	5.3	
500	500	0	13	
1000	1000	0	26	
1500	1500	0	39	
1900	1900	0	50	

Function : Illuminance Measurement		Range :	20000	lx
Standard Value	UUC* Reading	Error	Uncertainty	
(lx)	(lx)	(lx)	(± lx)	
2000	2000	0	0.053	
3000	3000	0	0.079	
4000	4000	0	0.11	
5000	4980	-20	0.14	

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

UUC* = Unit Under Calibration.

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a 1155843



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 22PH667
Page: 1 of 2

Equipment: Lux Meter
Manufacturer: Delta OHM
Model: HD2102.21
Serial No.: 16002032
ID No.: RYG_FS0200
Condition As-Received: Used Item
Received Date: 23 December 2022
Calibration Date: 28 December 2022

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.

Reference: 2212-0684WSC Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-PH01 by measuring against
luminous-intensity standard lamp (source-based method) According to the inverse square law measurement
method.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encoder	LMguide 9,6 m	120RC003	DL-0064-22	20 Jul 2025
2) Luminous intensity standard lamp	OL FEL-U	F-1542	TP-1021-22	21 Mar 2023

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

3. Test Equipment: Programmable Voltage/Current Source (Model: OL83A, S/N: 16221394).

4. Test Equipment: Illuminance Meter (Model: 51002, S/N: 080129).

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

6. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

REVIEW BY *Mingkearn P.*
APPROVED BY *h.k.*
NEXT CAL. DATE *28/12/23*

Calibrated by: Nival Nitas
Issue Date: 29 December 2022

Approved Signatory: *[Signature]*
☐ Phalinee Prabpaijal
☐ Chatchawan Khunpluek
☒ Nuntawat Khamchai

B 0305062



Cert. No.: 22PH667
Page: 2 of 2

Result of calibration:-

Function : Illuminance Measurement	Range : Autorange		
Standard Value	UUC* Reading	Error	Uncertainty
(lx)	(lx)	(lx)	(± lx)
0	0.00	0.00	0.060
15	15.31	0.31	0.27
100	100.99	0.99	1.8
500	501.9	1.9	9.0
1000	1002.0	2.0	18
2000	1983.0	-17.0	36
3000	2982	-18	54
4000	3901	-99	73
5000	4856	-144	91

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 %

Calibration with probe sensor s/n.: 22038597

UUC* = Unit Under Calibration.

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a 1141631



Cert.No.: 23TW168
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 21 July 2023
Test Date : 24 July 2023
Reference : 2307-0713DSC-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
() Malee Butkruea
() Saitthip Meangmai
() Warakorn Lemgagtrakul
Issue Date : 26 July 2023



B 0320211



Cert.No.: 23TW168
Page.: 2 of 2

Condition of this result of calibration

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 15E100464

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

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned 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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a 1172155



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

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 25 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Preecha Hlahib
Approved by :
Approved Signatory
() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai
Issue Date : 31 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0053616



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-0713DSC-2
Procedure Used :-

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

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

Condition of this result of calibration

1. Reference standard instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Digital Thermometer 2188080 221285 TPA 21 Oct 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 1228475367

Calibration Point	Immersion Depth	Standard Temperature	UUC* Reading	Error	Uncertainty	Coverage Factor
(°C)	(mm)	(°C)	(°C)	(°C)	(± °C)	k
20.00	100	20.011	19.91	-0.101 °	0.15	2.00

UUC* : Unit Under Calibration

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

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a 1159515



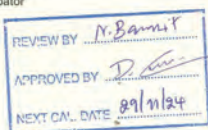
TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD NO.18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9884



Cert. No.: 23TM962
Page : 1 of 3

Certificate of Calibration

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 : 29 May 2023
Calibration Date : 29 May 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Ponthippa Tameyakul
() Mailee Butkruea
(✓) Suwit Imjai



Issue Date : 7 June 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0054967



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0896OC-2
Procedure Used :-

Cert. No.: 23TM962
Page : 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	22LM93	02 Jul 2023

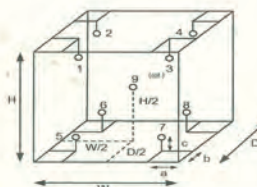
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	23
REL.Humid. (%)	54	56
AC Supply (Volt)	223	222



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 = 0.75 m³

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-10
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09

a 1165130



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2305-0896OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM962
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.019	0.72	1.0	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.547	19.780	19.487	19.529	19.408	20.139	20.112	20.406	20.116	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 standard 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 %.

-oOo-

a 1165129

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2543 8361-6, e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

Model Number : MSE224S-100-DU
Description : Analytical Balance
Serial Number : 0026207038
ID No. : RYG_EN0002
Manufacturer : Sartorius
Certificate No. : 23BCI0112
Issued Date : Friday, March 03, 2023
Reference No. : 204833
Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T: Maenam Khu, A. Pluak Daeng, Rayong 21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T: Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand.

Calibrated By : Mr. Chonchai Inthana

Calibration Date : Wednesday, March 01, 2023

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

Metrological data :

Capacity : 220 g Readability : 0.0001 g

Ambients Conditions:

Temperature : 23.6 °C ± 5.0 °C
Humidity : 60.0 % RH ± 10.0 % RH
Pressure : ±

Reasons for calibration

☐ New Installation ☐ Service / Repair ☐ Re-calibration / Maintenance

Equipment Condition: ☒ Good Operator ☐ Fair

Measurement Method UKAS Publication Ref : Lab 14

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

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2.YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp. Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relate and apply this equipment only.

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Mr. Chonchai Inthana (Technical Manager)



SOP FM 33 03 February 2022

Certificate of Calibration

Model Number : MSE224S-100-DU Certificate No. : 23BCI0112
Description : Analytical Balance Issued Date : Friday, March 03, 2023
Serial Number : 0026207038 Reference No. : 204833
ID No. : RYG_EN0002
Manufacturer : Sartorius Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The repeatability is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability qualitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to GMI, R96).		
Nominal Value : (Low Load)	20.0000	199.9999	Nominal value :	100	g
20 g	20.0000	200.0000	Tolerance	0.0004	g
Tolerance	0.0001	g	Difference		
	20.0000	199.9999	1	-	
	20.0000	200.0000	2	-0.0001	
Nominal Value : (High Load)	20.0000	199.9999	3	-0.0001	
200 g	19.9999	200.0000	4	0.0001	
Tolerance	0.0001	g	5	0.0002	
	20.0000	200.0000	6	-	
Standard Deviation	0.00003	0.00005			

Linearity

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

Tolerance 0.0002 g				
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00014
0.05	0.0500	0.0500	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
0.5	0.5000	0.5000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0001	0.0001	0.00014
20	20.0000	20.0000	0.0000	0.00024
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	99.9999	-0.0001	0.00019
200	200.0000	200.0000	0.0000	0.00032

End of Report.

SOP FM 33 03 February 2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert. No.: 22TM1492
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UM 400
Serial No. : b495.0899
ID No. : RYG_EN0006
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5, T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140, Thailand
Location : Oven Room
Received Order : 20 October 2022
Calibration Date : 20 October 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hlahib
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

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.

A 0046905



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-1
Cert. No.: 22TM1492
Page : 2 of 3

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

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

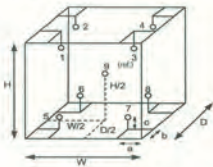
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.33 m
b = 5.0 cm W = 0.40 m
c = 5.0 cm H = 0.40 m
Capacity = 0.053 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	43	47
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-1
Cert. No.: 22TM1492
Page : 3 of 3

Result of Calibration :-

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor K
70.0	70.0	70.0	0.079	0.47	0.77	0.42	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	70.262	69.995	70.079	70.177	70.664	70.039	70.688	70.149	70.328

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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Cert. No.: 22TM1491
Page: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNB22
Serial No. : L513.0648
ID No. : RYG_EN0061
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
816/10 Moo 5, T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140, Thailand
Location : Wet Chemistry Lab
Received Order : 20 October 2022
Calibration Date : 20 October 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hiahib
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai



Issue Date : 2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0046906



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2210-0376OC-4
Procedure Used :-

Cert. No.: 22TM1491
Page: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

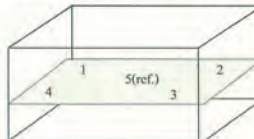
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	53	222
Finished of Calibration	24	50	221



Front

Position :	Ref. Std. S/N.:
1	N37P300726
2	N37P300727
3	N37P300728
4	N37P300729
5(ref.)	N37P300730

Mala

a 1132471



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2210-0376OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM1491
Page: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.527	84.563	84.628	84.516	84.580

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
85.0	0.12	0.081	0.18	2

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

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

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

UUC* : Unit Under Calibration

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

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

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Mala

a 1132470



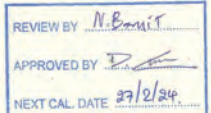
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Cert.No.: 23CH275
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenCompact S220
Serial No. : C104059460
ID No. : RYG_EN0183
Condition As-Received : Used Item
Received Date : 24 February 2023
Calibration Date : 27 February 2023
Reference : 2302-0886DSC-2
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
816/10 Moo 5, T.Maenam Khu, A.Plukdaeng,
Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :-
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer



Calibrated by : Walalak Sirirathan

Approved by :
Approved Signatory

() Malee Butkruea
() Sathip Meangmai
() Warakom Lemgatrakul

Issue Date : 28 February 2023

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.

A 0051538



Cert.No.: 23CH275
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	221306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH	pH		
pH Meter S/N.: C104059460	4.000	177.48	177.4	4.000	0.058	2.00	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00	2.00

Sathip

a 1149925



Cert.No.: 23CH275
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.: 1453404	4.008	4.008	179.1	0.0046	2.00
	6.987	6.988	4.7	0.0084	2.00
	10.010	10.013	-172.4	0.0069	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM

- Serial No. : 1453404

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	24.8	-0.201	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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Sathip

a 1149924



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Certificate of Calibration

Certificate No.: 23E753
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: 24 February 2023
Calibration Date: 28 February 2023

Reference: 2302-0886DSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 10) %

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)

616/10 Moo 5, T.Maenam Khui, A.Pluakdaeng,
Rayong 21140, Thailand

Procedure used: Calibration was conducted using In-house calibration Procedure CPE17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1. Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	22E1670	18 May 2023

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 Certification is traceable to the International System of Unit maintained at:-
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Wulchareeporn Wongchulkrane
Issue Date : 02 March 2023

Approved Signatory :
[] Phalinee Prabpaipai
[x] Nuntawet Khamchai
[] Pornthippa Tameyakul

B 0309672



Cert. No.: 23E753
Page.: 2 of 2

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

Function: DC voltage measurement	Range: 2000 mV		
Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(\pm μ V)
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	58
50.0000	50.0	0.0	62
100.0000	99.9	-0.1	65
150.0000	149.9	-0.1	69
200.0000	199.9	-0.1	72

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

UUC* = Unit Under Calibration.

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a 1150477



Cert.No.: 23CH1085
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C232588424
ID No. : RYG_FS0605
Condition As-Received: Used Item
Received Date : 01 September 2023
Calibration Date : 04 September 2023
Reference : 2309-0010DSC-1
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 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)
Calibrated by : Warakorn Lemgagrakul
Approved by :
() Saitip Meangmal
() Warakorn Lemgagrakul
() Ponpan Palpim
Issue Date : 7 September 2023

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.

A 0058056



Cert. No.: 23CH1085
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 43160066 130RC092 23E1284 09 Apr 2024
This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)
2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835
- | Buffer Solution | Manufacturer | Lot No. | Exp. date |
|-----------------|--------------|---------|-------------|
| pH 4.008 | CPA chem | 863832 | 28 Dec 2024 |
| pH 6.986 | CPA chem | 863833 | 28 Dec 2023 |
| pH 10.010 | CPA chem | 863835 | 28 Dec 2023 |

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: C232588424	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	-177	10.00	0.58	2.00

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 (±)	Coverage factor k
pH Electrode S/N.: 2465869	4.008	4.01	185	0.0085	2.05
	6.986	6.99	12	0.0099	2.00
	10.010	10.01	-165	0.0092	2.00

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

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Saitip

a 1178953



Cert. No.: 23LM153
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C232588424
ID No. : RYG_FS0605
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 : 01 September 2023
Calibrated Date : 05 September 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprat
Approved by :
() Ponthippa Tameyakul
() Ponpan Palpim
() Suwit Imjai
Issue Date : 6 September 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0058111



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2309-0010DSC-2
Procedure Used :-

Cert. No.: 23LM153
Page.: 2 of 2

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

Condition of this result of calibration

1. Reference standard Instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Digital Thermometer A7B843 23I24 TPA 04 Jan 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :-

(*) Without Adjustment
Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 2465869

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	120	25.003	25.3	0.297	0.16	2.00
30.0	120	30.003	30.3	0.297	0.16	2.00
40.0	120	40.004	40.4	0.396	0.16	2.00
50.0	120	50.003	50.4	0.397	0.16	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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Suwit

a 1178764



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Cert.No.: Z3CH552
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenGo S2
Serial No. : B712869298
ID No. : RYG_FS0299
Condition As-Received: Used Item
Received Date : 28 April 2023
Calibration Date : 02 May 2023
Reference : 2304-0759DSC-1
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 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Warakorn Lemgagrakul

Approved by :
Approved Signatory

(/) Malee Bulkruea
(/) Sathip Meangmai
(/) Warakorn Lemgagrakul

Issue Date : 8 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0053786



Cert. No.: Z3CH552
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	22E2769	24 Aug 2023

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials :- The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	178	4.00	0.58	2.00
S/N.: B712869298	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.00	0.58	2.00

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 (±)	Coverage factor k
pH Electrode	4.008	4.01	180	0.0079	2.00
S/N.: B455109	6.987	6.99	7	0.011	2.00
	10.010	10.01	-167	0.0095	2.00

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

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A 1159704



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Cert. No.: 23LM91
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : SevenGo S2
Serial No. : B712869298
ID No. : RYG_FS0299
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 : 28 April 2023
Calibrated Date : 03 May 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Kunchit Promrat

Approved by :
Approved Signatory

(/) Ponthippa Tameyakul
(/) Malee Bulkruea
(/) Suwit Imjai

Issue Date : 8 May 2023

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.

A 0053787



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2304-0759DSC-3

Cert. No.: 23LM91
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:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1502A	A7B843	23J24	04 Jan 2024

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 8455109

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.003	25.2	0.197	0.16	2.00
30.0	100	30.000	30.3	0.300	0.16	2.00
40.0	100	40.003	40.3	0.297	0.16	2.00
50.0	100	50.002	50.3	0.298	0.16	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 %.

-o0o-

A 1159703



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TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert.No.: 23CH721
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : B851952376
ID No. : RYG_FS0425
Condition As-Received: Used Item
Received Date : 07 June 2023
Calibration Date : 08 June 2023
Reference : 2306-0162DSC-1
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 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

REVIEW BY *Pattanyan*
APPROVED BY *Saithip*
NEXT CAL DATE *08/06/24*

Calibrated by : Uthen Kankawi

Approved by : *Saithip*
Approved Signatory

() Malee Butkrusa
(✓) Saithip Meangmai
() Warakorn Lemgagrakul

Issue Date : 12 June 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0055209



Cert. No.: 23CH721
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	23E1284	09 Apr 2024

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.986	CPA chem	863833	28 Dec 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	178	4.00	0.58	2.00
S/N.: B851952376	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

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 (±)	Coverage factor k
pH Electrode	4.008	4.01	170	0.0099	2.11
S/N.: 1190753	6.986	6.99	-3	0.012	2.05
	10.010	10.01	-176	0.014	2.13

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

-00-

A 1162921



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Cert.No.: 23CH915
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C129171496
ID No. : RYG_FS0550
Condition As-Received: Used Item
Received Date : 21 July 2023
Calibration Date : 24 July 2023
Reference : 2307-0713DSC-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 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

REVIEW BY *Pattanyan*
APPROVED BY *Saithip*
NEXT CAL DATE *24/07/24*

Calibrated by : Warakorn Lemgagrakul

Approved by : *Saithip*
Approved Signatory

() Malee Butkrusa
(✓) Saithip Meangmai
() Warakorn Lemgagrakul

Issue Date : 26 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0056665



Cert. No.: 23CH915
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.986	CPA chem	863833	28 Dec 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	177	4.00	0.58	2.00
S/N.: C129171496	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.00	0.58	2.00

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 (±)	Coverage factor k
pH Electrode	4.008	4.01	185	0.0079	2.00
S/N.: 3184175	6.986	6.99	12	0.011	2.00
	10.010	10.01	-166	0.0095	2.00

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

-00-

A 1172154




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Cert. No.: 23LM126
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : SevenGo S2
Serial No. : C129171496
ID No. : RYG_FS0550
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 : 25 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Preecha Hahib
Approved by : 
() Pornthippa Tameyakul
() Malee Butkruea
(✓) Suwit Imjai
Issue Date : 31 July 2023

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.

A 0053617



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-0713DSC-4
Procedure Used :-

Cert. No.: 23LM126
Page.: 2 of 2

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	2211285	TPA	21 Oct 2023

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 3184175

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.007	25.3	0.293	0.16	2.00
30.0	100	30.004	30.4	0.396	0.16	2.00
40.0	100	40.005	40.4	0.395	0.16	2.00
50.0	100	50.009	50.4	0.391	0.16	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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a 1159514

RYG_EN0010





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Cert. No.: 22TM1517
Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UFE 500
Serial No. : G511.1572
ID No. : RYG_EN0010
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 20 October 2022
Calibration Date : 20 October 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by : 
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 2 November 2022

REVIEW BY 
APPROVED BY 
NEXT CAL DATE 30/04/24

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.

A 0046908



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-2
Procedure Used :-

Cert. No.: 22TM1517
Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

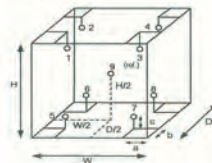
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY49023932	22LM97	29 Jul 2023

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.40 m
W = 0.56 m
H = 0.48 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL. Humid. (%)	54	59
AC Supply (Volt)	223	225

Ref. Std. ID No.: @ Calibration Point		
Position :	(180) °C	(104) °C
1	21-16TC-01	20-16RTD-01
2	21-16TC-02	20-16RTD-02
3	21-16TC-03	20-16RTD-03
4	21-16TC-04	20-16RTD-04
5	21-16TC-05	22-16RTD-05
6	21-16TC-06	20-16RTD-06
7	21-16TC-07	20-16RTD-07
8	21-16TC-08	22-16RTD-08
9 (ref.)	21-16TC-09	22-16RTD-09

a 1132466

Certificate of Calibration

Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2210-03760C-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM1517
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.076	0.52	0.60	0.42	2
180.0	180.0	180.0	0.13	0.88	1.2	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.768	103.734	103.723	103.800	104.215	104.131	104.132	103.740	103.747
180.0	179.723	179.359	179.439	179.489	180.361	180.114	180.131	180.243	179.605

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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a 1132465

Equipment: Block Digestion Unit
 Model: KT-20s
 Serial No. (or ID.): 5720210009/5770200073
 Manufacturer: Gerhardt
 Condition: In Condition

Certificate No.: C29230010
 Issued Date: 18 March 2023
 Job No.: KSPR2304362
 Page: 1 of 4
 Digestion Block: 20 holes.

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

Environment Condition: Temperature: 25 °C ± 0.5 °C
 Humidity: 65 %RH ± 3.7 %RH
 Voltage: 231 VAC ± 3.1 VAC

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. Nakarin Ruenros

Calibration Date: 15 March 2023

The Method used: In house method, base on by comparison with standard

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL) Certificate No.: TC22/0080

REVIEW BY: *[Signature]*
 APPROVED BY: *[Signature]*
 NEXT CAL. DATE: 15/03/24

[Signature]
 (Mr. Nakarin Ruenros)
 Person in charge

[Signature]
 (Mr. Udon Srichana)
 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. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

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 2533 Sukhumvit Road, Bangkok, Prachinburi 10280
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CAL-FM-C29-07: 20 Jul 2022

Certificate No.: C29230010

Page: 2 of 4

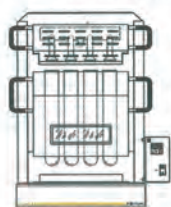
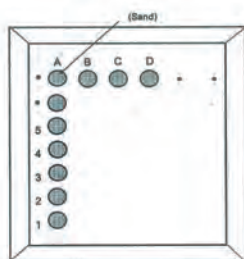


Fig. 1.: Front view



Location of standard

Fig. 2.: Digestion block

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the Digestion block.

Measured Temperature: The average reading of working standard at any positions or location.

Certificate No.: C29230010

Page: 3 of 4

Calibration Results:
Before adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	380	380	380	375.1	-4.9	1.5
A2				374.3	-5.7	1.5
A3				374.8	-5.4	1.5
A4				376.3	-3.7	1.5
A5				373.2	-6.8	1.5
B1				374.4	-5.6	1.5
B2				374.3	-5.7	1.5
B3				374.6	-5.4	1.5
B4				375.2	-4.8	1.5
B5				375.1	-4.9	1.5
C1				373.5	-6.5	1.5
C2				372.8	-7.2	1.5
C3				372.1	-7.9	1.5
C4				372.2	-7.8	1.5
C5				374.5	-5.5	1.5
D1				374.7	-5.3	1.5
D2				375.3	-4.7	1.5
D3				375.5	-4.5	1.5
D4				375.8	-4.2	1.5
D5				375.1	-4.9	1.5

Calibration Results:
After adjustment

Certificate No.: C29230010

Page: 4 of 4

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (±°C)
A1	380	380	380	379.0	-1.0	1.5
A2				378.7	-1.3	1.5
A3				379.4	-0.6	1.5
A4				379.2	-0.8	1.5
A5				379.2	-0.8	1.5
B1				379.8	-0.2	1.5
B2				379.2	-0.8	1.5
B3				379.5	-0.5	1.5
B4				378.9	-1.1	1.5
B5				379.1	-0.9	1.5
C1				379.1	-0.9	1.5
C2				377.7	-2.3	1.5
C3				378.4	-1.6	1.5
C4				378.2	-1.8	1.5
C5				378.0	-2.0	1.5
D1				379.5	-0.5	1.5
D2				378.7	-1.3	1.5
D3				379.7	-0.3	1.5
D4				379.5	-0.5	1.5
D5				379.4	-0.6	1.5

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2304362

ชนิดเครื่องมือ: Block Digestion Unit

รุ่น: KT-20s

หมายเลขเครื่อง: 5720210009/5770200073

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
15 Mar 2023			15 Mar 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพหน้าปัด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ :

Mr. Nakin Rueros
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110
Phone: +66 2038 7000 Email: info@dksh.co.th Website: www.dksh.com/thailand

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CAL-FM-C29-07: 20 Jul 2022

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TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert.No.: 22CH1733
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date : 21 December 2022
Calibration Date : 22 December 2022
Reference : 2212-0602DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
618/10 Moo 5 T.Maenam Khu.
A.Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagrakul

Approved by :
Approved Signatory

(/) Malee Butkruea
() Saitip Meangmai
() Warakorn Lemgagrakul

Issue Date : 26 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048758



Cert.No.: 22CH1733
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.867	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
		pH	mV	mV	pH		
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00	
S/N: B834291445	7.000	0.00	-0.1	7.000	0.058	2.00	
	10.000	-177.48	-177.5	10.000	0.058	2.00	

a 1141167



Cert.No.: 22CH1733
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	4.008	4.011	185.2	0.0052	2.06
S/N: 1475518	6.987	6.990	10.4	0.0088	2.00
	10.008	10.014	-166.5	0.0072	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: InLab Expert Pro-ISM

- Serial No.: 1475518

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	24.9	-0.101	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 %.

-o-o-

a 1141166



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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 22E4098
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152

Condition As-Received: Used Item
Received Date: 21 December 2022
Calibration Date: 23 December 2022

Reference: 2212-0602DSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 10) %

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 In-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6315011	22E1431	05 May 2023

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 Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Wulchareporn Wongchulkrane
Issue Date: 26 December 2022

Approved Signatory:

Phalinee Prabpaipal
Nuntawat Khamchai
Ponrithippa Tameyakul

B 0304803



Cert. No.: 22E4098
Page: 2 of 2

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

Function: DC voltage measurement

Range: 2000

mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (\pm μ V)
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	58
50.0000	50.0	0.0	62
100.0000	100.0	0.0	65
150.0000	150.0	0.0	69
200.0000	199.9	-0.1	72

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.

-o-o-

a 1140616



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 23E3924
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152

Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 14 December 2023

Reference: 2312-0151DSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 10) %

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:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5502A	2435802	EE-0041-23	26 Apr 2024

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 Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Napachanok Prasomsocsi
Issue Date: 15 December 2023

Approved Signatory:

Phalinee Prabpaipal
Nuntawat Khamchai
Pongsagorn Boonyaporn

B 0331106



Cert. No.: 23E3924
Page.: 2 of 2

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

Function: DC voltage measurement Range: 2000 mV

Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(± μV)
-200.0000	-199.9	0.1	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	50.0	0.0	61
100.0000	100.0	0.0	63
150.0000	150.0	0.0	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-

a 1193422



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD, 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3089-29 FAX: 0-2716-9484



Cert.No.: 23CH1574
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date : 08 December 2023
Calibration Date : 15 December 2023
Reference : 2312-0151DSC-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 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemagatrakul

Approved by :
Approved Signatory

() Sathip Meangmai
() Warakorn Lemagatrakul
(✓) Ponpan Paipim

Issue Date : 19 December 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0061696



Cert.No.: 23CH1574
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4962054	110RC044	23I908	28 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913598	14 July 2025
pH 6.986	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH	pH		
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00	
S/N.: B834291445	7.000	0.00	-0.1	7.000	0.058	2.00	
	10.000	-177.48	-177.5	10.000	0.058	2.00	

a 1193852



Cert.No.: 23CH1574
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 (±)	Coverage factor k
pH Electrode S/N.: 3225368	4.008	4.013	184.1	0.0045	2.00
	6.986	6.998	8.7	0.0084	2.00
	9.997	10.002	-164.7	0.0088	2.11

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Pro-ISM
- Serial No. : 3225368

- 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 (± °C)	Coverage factor k
25.0	25.003	24.3	-0.703	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-

a 1193851

7700 Series ICP-MS Preventive Maintenance Checklist – Standard



Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

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

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Service Engineer's Responsibilities

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

REVIEW BY	Supakorn N.
APPROVED BY	Supakorn N.
NEXT CAL. DATE	11/06/2024

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7700 Series ICP-MS Preventive Maintenance Checklist – Standard



System Information

Instrument system name and ID	7700X ICP-MS
Instrument system site and location	ALS Laboratory Group (Thailand) Co., Ltd.
List system component product numbers	List the serial numbers of each component
1. G3281A	1. 7812091612
2. G3292A	2. 4N4220700
3. ASX 500	3. US 021293A510
4.	4.
5.	5.
6.	6.
7.	7.

ICP-MS configuration table	Circle the type or write in the type if other
Nebulizer	MicroMist Micro Flow <u>Mist</u> other
Spray Chamber	<u>Quartz</u> PFA other
Torch	<u>Quartz</u> Demountable other
Sampling Cone	<u>Su</u> Pt other
Skimmer Cone	<u>Su</u> Pt Ni plated other

Preparation

- Discuss any specific issues with the customer prior to starting.
- Review the instrument logbook.
- Save instrument control settings before starting the procedure.
- Perform general inspection of system for cleanliness.
- Check for proper installation of safety-related parts, assemblies, sensors etc.
- Check for required firmware updates and verify with customers if they would like it installed.
- Begin system vent.

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Inspect and clean system while venting

- Perform a general inspection of the system.
- Look for any obvious external damage or problems.
- Check mechanical pumps for evidence of excessive fluid leaks.
- Inspect vacuum hoses, pump exhaust tubes and power cord for excessive wear.
- Inspect Shield plate contacts. Clean if needed.
- Inspect the tape lining on the peristaltic pump clamp; replace the tape if worn (5043-0030).
- Check electronics for dust accumulation, clean if necessary.

Mechanical vacuum pumps

- Drain and replace mechanical pump fluid.
- Verify proper oil recycling function of mechanical pumps, the gas ballast valve must be open.
- Replace the oil mist filter.
- Inspect and clean or replace the inlet filter (P/N 5190-0145 for E2M18, P/N SR03700237 for DS402).
- Verify proper oil recycling function of mechanical pumps, the gas ballast valve must be open when connected to an Edwards E2M18.

Cooling water system

- Drain cooling fluid
- Remove, clean and reinstall metal mesh filter.
- Re fill Polyclear cooling fluid (G3292-80010)
- Clean the Air filter and the Condenser by compressed air or vacuum cleaner

Ion lens cleaning

- Remove extraction/omega lenses and clean all lenses.
- Remove ORS cell, plate bias and deflet lens, clean all lenses.
- Replace octopole. Reinstall all lenses and the ORS cell and close analyzer.

Auto Sampler ASX500 Series

- Clean external surfaces of the Autosampler, this will protect the service technician from potential chemical burns
- Z-Axis Inspection Inspect the Z-axis PEEK drive cable for kinks or slight bends. Power off the autosampler and manually move the Z-drive up and down using the rotor on the rear of the instrument. Inspect the Z-axis drive cable for kinks or slight bends. If the movement is rough and hard to move then replace Z-axis drive cable (P/N G3286-80331) or Z-axis drive assembly (P/N G3286-80330)

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- Pump Tubing Replacement
Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- QC Testing
Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and ensure that the probe is centered in the vial
- Final Inspection
Check that all components are tight

Auto Sampler I-AS

- Clean external surfaces of the Autosampler, this will protect the service technician from potential chemical burns
- Pump Tubing Replacement
Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles.
- QC Testing
Using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial.

ISIS

- Replace ISIS valve seal (P/N G3138-05117)
- Inspect the tape lining on the peristaltic pump clamp; replace the tape if worn (5043-0030).
- QC test
Verify the function of valve and Peripump. Make sure that there is no leak from the valve and pump tubing connections.

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Restore Instrument

- ☒ Pump system down.
- ☒ Perform the system post check.
 - ☒ Check quadrupole matching.
 - ☒ Perform octopole matching.
 - ☒ Verify good gas control function by changing the flow and observing the meter readings, perform an automatic offset adjustment for the MPC's.
 - ☒ Verify in Tune (using the customer's last tune) that changes in lens voltage result in the expected sensitivity change.
 - ☒ Perform Startup including performance report and an Autotune. Print the Autotune report and attach it to this checklist.
 - ☒ Check the instrument status and record the measurements in the status table. (Use "Record Log" in "Maintenance LogBook" with G7200B software, Use Performance report with G7201A/B software)
 - ☒ Record the EM and discriminator Voltages in the results table.
 - ☒ Run 10 minute stability test with tune solution. Check the result of RSD is below 4%.

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Make an entry in the MassHunter Maintenance Log Book recording the PM activities.
- ☒ Update/reset instrument maintenance counters as appropriate
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section below if there are additional comments
- ☒ Review the service and any test results with the customer.
- ☒ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

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7700 Series ICP-MS Status Results Table

☐ Check this box if you have run a performance report to record the meter readings. Print out the report and attach it to this checklist, instead of completing the table.

Measurement	Standby Mode	Analysis Mode No Gas Mode	Analysis Mode H ₂ Gas @ 4ml/min	Analysis Mode He Gas @ 4ml/min
IP/BK Press	2.65 Pa	2.62 Pa	- Pa	2.62 Pa
TMP Revolution	100 %	100 %	- %	100 %
Analyzer Press	8.54x10 ⁻⁵ Pa	2.95x10 ⁻⁵ Pa	- Pa	8.15x10 ⁻⁵ Pa
Water RF/WC/IF	0	1.50 L/min		
Water Temperature		22.1 °C		
Inlet Temp	15.0 °C	29.9 °C		
Internal Temp	15.0 °C	46.0 °C		
RF Power		15.91 Watts		
RF Reflect		5 Watts		
Plasma Freq.		26.74 MHz		
Carrier Gas (BP)		4.41 kPaG		
Ar Gas Tank Press		5.19 kPaG		
Carrier Gas		1.00 L/min		
MU/Dil. Gas		0.10 L/min		
Plasma Gas		15.00 L/min		
Aux Gas		0.90 L/min		
S/C Temperature		2.0 °C		
OP Gas Tank Press ¹	- kPaG	- kPaG		
Optional Gas *1		- %		

Do not fill in the shaded cells in the table. There are no measurements for these combinations.

Notes:

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7700 Series ICP-MS Preventive Maintenance Checklist - Standard



7700 Series ICP-MS Test Results Table

Test Description	Expected Test Result	Actual Test Result
Analog HV Voltage	Not applicable	1761 V
Pulse HV Voltage	Not applicable	1486 V
Discriminator Voltage	Not applicable	4.5 mV

7700 Series ICP-MS Parts List Table

Part Description	Part Number	Product/Model # where used	Quantity Consumed
1L Rough Pump Oil	6040-0834	7700 ICP-MS	2
Oil Mist Filter Kit for E2M18	3162-1056	7700 ICP-MS	1
Oil Mist Filter for DS402	0460342M002	7700 ICP-MS	-
Graphite Gasket for Sample Cone (3pk)	G3280-07009	7700 ICP-MS	1
7700 Octopole	G3280-07045	7700 ICP-MS	1
Polyclear cooling fluid	G3292-80010	G1870B/G3292A	1
Rinse / Drain tubing	G3286-80117	ASX-500	1
Tubing / connection kit for drain	G3286-80118	ASX-500	1
Peristaltic pump tubing set	G3160-65326	I-AS	-
Drain tubing to rinse bottle and drain bottle	G3160-65328	I-AS	-
Rotor seal for Valve (ISIS)	G3138-05117	ISIS	1
Additional parts may be required from engineers stock:			
Inlet Filter E2M18	5190-0145	7700 ICP-MS	-
Inlet Filter DS402	SR03700237	7700 ICP-MS	-
Peristaltic pump tape (30m roll)	5043-0030	7700 ICP-MS	-
Polishing Paper Kit (#400/#1200, 5 sheets each)	G1833-55404	7700 ICP-MS	-
Cotton Swabs, ultra-fine conical bud shape at both ends (100/pk)	8300-2574	7700 ICP-MS	-
Alumina Powder	8660-0701	7700 ICP-MS	-
lint-free-paper	05980-60051	7700 ICP-MS	-
Z-Axis Drive PEEK Cable (Anti-Kink)	G3286-80331	ASX-500	-
Z-Axis Drive Assembly (PEEK, Anti-Kink)	G3286-80330	ASX-500	-

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7700 Series ICP-MS Preventive Maintenance Checklist - Standard



Service Engineer Comments (optional)

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

Other Important Customer Web Links

- ☐ How to get information on your product: Literature Library - <http://www.agilent.com/chem/library>
- ☐ Need to know more? - www.agilent.com/chem/education
- ☐ Need technical support, FAQs? - www.agilent.com/chem/techsupp
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 600 614263 Date service completed 12 June 2023

Agilent signature [Signature] Customer signature Supakwan N.

Document part number: G3280-90078

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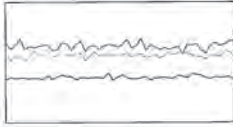
Agilent Technologies

Tune Report

Operator Name: Sugakorn Mak
Acq/Data Batch: C:\Agilent\NCPM\11\User Tune 1
Acq. Date-Time: 8/12/2023 4:05:12 PM
Report Comment: PM 12 June 2023
Instrument Name: GC328 (A-IP12051612)

(No Gas)

Sensitivity



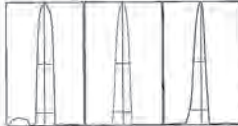
Mass	Range	Count	RSD%	Background
7	10000	6240	4.494	2.190
89	50000	27817	3.328	3.800
205	50000	18565	3.537	9.800

Sampling Period [sec]: 0.311
Integration Time [sec]: 0.1

Oxide/Doubly Charged Ratio

Oxide: 156 / 140 1.482 %
Doubly Charged: 70 / 140 1.508 %

Resolution/Axis



Mass	Peak Height	Axis	W-50%	W-15%
7	8337.66	7.00	0.64	0.730
89	27591.94	89.00	0.55	0.716
205	18018.73	205.00	0.46	0.726

Integration Time [sec]: 0.1
Acquisition Time [sec]: 22.74
V Axis: Linear

Tune Parameters

Plasma Parameters

Plasma Mode: —
RF Power: 1550 W
RF Matching: 1.80 V
Sample Depth: 8.0 mm
Nebulizer Gas: 1.00 L/min
Oxygen Gas: —
Nebulizer Pump: 0.10 rps
S/C Temp: 2 °C
Makeup Gas: 0.10 L/min
Auxiliary Gas: 0.80 L/min
Plasma Gas: 15.0 L/min

Lens Parameters

Extract 1: 0.0 V
Extract 2: -145.0 V
Omega Bias: -90 V
Omega Lens: 6.4 V
Cell Entrance: -30 V
Cell Exit: -50 V
Defect: 11.8 V
Plate Bias: -40 V

Cell Parameters

Use Gas: No
He Flow: 9.0 mL/min
3rd Gas Flow: —
OctP Bias: -8.0 V
Energy Discrimination: 5.0 V

1 of 3

8/12/2023 4:05 PM

Tune Report

H2 Flow: —
OctP RF: 190 V
QP Parameters: Mass Gain: 145, Mass Offset: 124, Axis Gain: 1.0021, Axis Offset: 0.12, QP Bias: -3.0 V
Hardware Settings: Torch: Torch H: -0.4 mm, Torch V: 0.0 mm, EM: Discriminator: 4.5 mV, Analog HV: 1748 V, Pulse HV: 1496 V

(He)

Sensitivity



Mass	Range	Count	RSD%	Background
59	20000	11826	2.752	7.200
89	20000	12367	2.527	5.800
205	50000	25671	2.768	13.300

Sampling Period [sec]: 0.31
Integration Time [sec]: 0.1

Oxide/Doubly Charged Ratio

Oxide: 156 / 140 1.166 %
Doubly Charged: 70 / 140 1.566 %

Tune Parameters

Plasma Parameters

Plasma Mode: —
RF Power: 1550 W
RF Matching: 1.80 V
Sample Depth: 8.0 mm
Nebulizer Gas: 1.00 L/min
Oxygen Gas: —
Nebulizer Pump: 0.10 rps
S/C Temp: 2 °C
Makeup Gas: 0.10 L/min
Auxiliary Gas: 0.80 L/min
Plasma Gas: 15.0 L/min

Lens Parameters

Extract 1: 0.0 V
Extract 2: -200.0 V
Omega Bias: -90 V
Omega Lens: 7.4 V
Cell Entrance: -90 V
Cell Exit: -70 V
Defect: 3.8 V
Plate Bias: -115 V

Cell Parameters

Use Gas: Yes
He Flow: 4.5 mL/min
H2 Flow: —
OctP RF: 200 V
3rd Gas Flow: —
OctP Bias: -21.0 V
Energy Discrimination: 3.0 V

QP Parameters

Mass Gain: 145, Mass Offset: 124, Axis Gain: 1.0021, Axis Offset: 0.12, QP Bias: -18.0 V

Hardware Settings

Torch: Torch H: -0.4 mm, Torch V: 0.0 mm

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8/12/2023 4:05 PM

Tune Report

EM: Discriminator: 4.5 mV, Analog HV: 1748 V, Pulse HV: 1496 V



Metrological Center

SCI ECO Services Company Limited

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

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

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

Certificate No. T231676

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Certificate of Calibration

Equipment : HEATING BLOCK

Manufacturer : Environmental Express

Model : SC 196

Serial No. : 6974CECW3285

Customer Code : BKK_EL0054

ID No. : T5306A3

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

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

Customer Location : Acid Digestion Lab

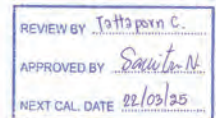
Date of Receipt : 13 September 2023

Calibrated By : Saneek Musikanan (Site Calibration Manager)

Approved By : / Sujjar Nakhakred (Site Calibration Manager)

Date of Issue : 26 SEP 2023

The uncertainties are for a confidence probability of approximately 95%.



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8/12/2023 4:05 PM

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.

PM-L12 (09/30-05-57)



Certificate No. T231676

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Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 22 September 2023
Environment : Temperature : 21.8-23.1 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to W1-T20.

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T230014	17 January 2024
TC	TYPE T	TN31-TN40	T230014	17 January 2024
DATA LOGGER	34970A	T151	T230014	17 January 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 20 Minute At 95 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By.

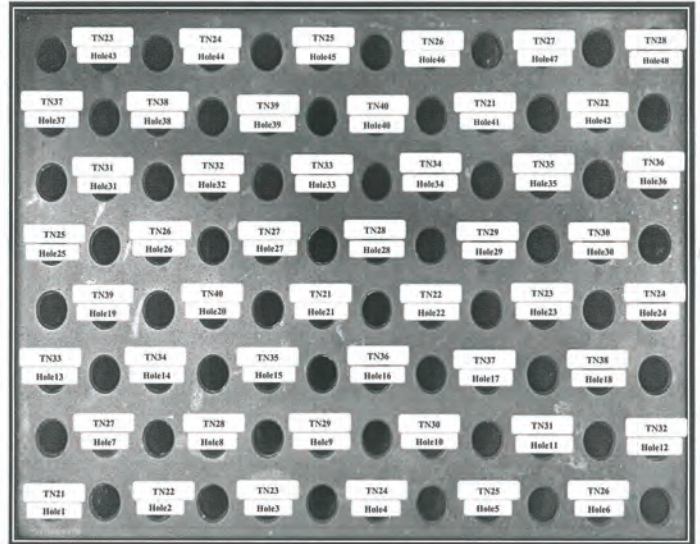
FM-L13 108/30-05-57



Certificate No. T231676

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Calibration Report



FRONT CONTROL

Approved By.

FM-L13 108/30-05-57



Certificate No T231676

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Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN21	TN22	TN23	TN24	TN25	TN26
CAL POINT	Max	95.01	94.41	95.20	95.41	94.51
	Min	94.57	93.95	94.75	94.92	94.00
	Average	94.79	94.18	94.98	95.17	94.26
R2 Hole7-Hole12	TN27	TN28	TN29	TN30	TN31	TN32
	Max	95.36	95.43	95.19	95.16	95.35
	Min	94.94	94.95	94.72	94.71	94.90
	Average	95.15	95.19	94.96	94.94	95.13
R3 Hole13-Hole18	TN33	TN34	TN35	TN36	TN37	TN38
	Max	95.37	95.50	95.22	95.21	95.33
	Min	94.99	95.09	94.78	94.82	94.88
	Average	95.18	95.30	95.00	95.02	95.11
R4 Hole19-Hole24	TN39	TN40	TN21	TN22	TN23	TN24
	Max	95.59	94.42	94.52	94.24	94.63
	Min	95.21	94.06	94.13	93.88	94.28
	Average	95.40	94.24	94.33	94.06	94.45
R5 Hole25-Hole30	TN25	TN26	TN27	TN28	TN29	TN30
	Max	95.19	95.38	92.93	95.30	95.14
	Min	94.83	95.03	92.56	94.95	94.79
	Average	95.01	95.20	92.75	95.12	94.96
R6 Hole31-Hole36	TN31	TN32	TN33	TN34	TN35	TN36
	Max	94.63	94.90	94.77	94.21	94.24
	Min	94.24	94.55	94.44	93.98	93.92
	Average	94.43	94.72	94.60	94.14	94.08
R7 Hole37-Hole42	TN37	TN38	TN39	TN40	TN21	TN22
	Max	94.30	94.44	94.04	93.81	94.89
	Min	93.95	94.05	93.67	93.48	94.39
	Average	94.13	94.24	93.86	93.65	94.64
R8 Hole43-Hole48	TN23	TN24	TN25	TN26	TN27	TN28
	Max	95.99	95.63	95.28	95.29	95.45
	Min	95.57	95.13	94.82	94.84	94.99
	Average	95.78	95.39	95.05	95.22	94.68

Approved By.

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Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN21	TN22	TN23	TN24	TN25	TN26
CAL POINT	Max	105.23	104.32	105.43	105.25	104.44
	Min	104.94	103.95	105.15	105.04	104.11
	Average	105.09	104.13	105.29	105.15	104.28
R2 Hole7-Hole12	TN27	TN28	TN29	TN30	TN31	TN32
	Max	105.30	105.12	105.18	105.22	105.12
	Min	105.11	104.92	104.96	105.00	104.92
	Average	105.20	105.02	105.07	105.11	105.02
R3 Hole13-Hole18	TN33	TN34	TN35	TN36	TN37	TN38
	Max	105.37	105.63	105.02	104.80	104.69
	Min	105.17	105.37	104.75	104.59	104.50
	Average	105.27	105.50	104.88	104.69	104.60
R4 Hole19-Hole24	TN39	TN40	TN21	TN22	TN23	TN24
	Max	105.31	104.43	106.41	104.71	105.63
	Min	105.08	104.22	106.15	104.41	105.37
	Average	105.19	104.33	106.28	104.56	105.50
R5 Hole25-Hole30	TN25	TN26	TN27	TN28	TN29	TN30
	Max	104.95	106.26	103.34	105.78	105.59
	Min	104.67	105.96	103.08	105.56	105.36
	Average	104.81	106.11	103.21	105.67	105.48
R6 Hole31-Hole36	TN31	TN32	TN33	TN34	TN35	TN36
	Max	104.75	104.86	104.80	105.20	104.50
	Min	104.54	104.63	104.59	105.00	104.32
	Average	104.65	104.75	104.69	105.10	104.41
R7 Hole37-Hole42	TN37	TN38	TN39	TN40	TN21	TN22
	Max	104.30	104.90	104.85	104.65	104.88
	Min	104.09	104.72	104.66	104.49	104.63
	Average	104.19	104.81	104.75	104.57	104.76
R8 Hole43-Hole48	TN23	TN24	TN25	TN26	TN27	TN28
	Max	105.71	105.85	105.39	105.61	105.42
	Min	105.45	105.61	105.14	105.27	105.18
	Average	105.58	105.73	105.27	105.44	105.30

Approved By.

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Certificate No. T231676

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Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
100.0	100.3, 100.5	100.4	0.26	0.81
107.0	107.0, 107.1	107.1	0.19	0.78

* 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=2 which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By: _____

FM-L13 108/30-05-57

Certificate No. T221644

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Certificate of Calibration

Equipment : Chamber (Cold Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK_EN0167

ID No. : T2463A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Environmental Laboratory

Date of Receipt : 27 June 2022

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : _____ / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 8 JUL 2022

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14 117/01-02-04



Certificate No. T221644

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 30 June - 1 July 2022
Environment : Temperature : 18.9-23.7 °C
Line Voltage : 222.9-226.5 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T210009	30 July 2022
TC	TYPE T	TN171-TN180	T210009	30 July 2022
DATA LOGGER	34970A	TJ49	T210009	30 July 2022

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 - Minute At 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

☐ without adjustment ☒ after adjustment

Approved By: _____

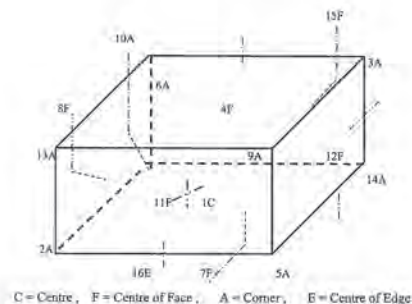
FM-L15 117/15-05-63



Certificate No. T221644

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Calibration Report



1C =	TN161
2A =	TN162
3A =	TN163
4F =	TN164
5A =	TN165
6A =	TN166
7F =	TN167
8F =	TN168
9A =	TN169
10A =	TN170

11F =	TN171
12F =	TN172
13A =	TN173
14A =	TN174
15F =	TN175
16E =	TN176

Approved By: _____

FM-L15 117/15-05-63

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	2.71	2.82	2.75	2.89	2.95	3.68	3.02	2.96	3.03	2.85
	TN171	TN172	TN173	TN174	TN175	TN176				
	2.97	3.02	2.89	3.04	2.97	3.33				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
3.0	2.9 , 4.0	3.2	2.99	1.05	1.50	1.66	2.00

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

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

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

Approved By: 

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน 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 จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิริะ จันทรเจต)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐

๒) นางสาวชัชชัย โกมารกุล ณ นคร

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑

๓) นายศรายุทธ จิตรานนท์

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒

๖) นายวิชาญ ชูณหะรัต

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓

(นายศิริระ จันทร์เจิด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา ไชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๙
๓) นางสาวชนัญญาญจน์ อัมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เฉลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรารักษ์ มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙
๘) นางสาวศิริลักษณ์ พึ่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายณพพงศ์ จันทรพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายนรเศรษฐ์ โกมลาลัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จรียา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๑
๑๕) นางสาวเบมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลพิสุทธิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิตตา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรรพรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวนพรัตน์ แยมกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๙
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปัตเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายอุทิศ อุ่นสิม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๔๒
๓๔) นางสาวจรรววรรณ พิมพ์อริกฤติยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๖

(นายศิระ จันทร์เจิด)

๓๕) นางสาวปรารค์ทิพย์...

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

สำนักงานสิ่งแวดล้อมและเฝ้าระวังมลพิษทางอากาศ

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๙
๓๖) นางสาวเดือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๑
๓๘) นายวรกร ผุ้รักษ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๙) นายทอง วิริยะสทกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๑) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๒) นายอรรคพล นิยมวิทยาพันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๔) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๖) นายอาทิตย์ ศรีแสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๗) นายเจษฎินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๘) นายจรัส บุญยั้ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๓
๕๐) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๔
๕๑) นางสาวสุภาขวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๕๒) นางสาวทัตพร ขวาลสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๓) นางสาวธิดิมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๔) นางสาวกนกอร เข้มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๕) นางสาวพัชรียา หงษ์สมดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๖) นางสาวภาวนิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๗) นางสาวภาณุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๘) นางสาวอุไรรัตน์ ทิงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๑) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๖) นางศิลปวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๗) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๘) นางสาวศรณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๖๙) นายนวกัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
๗๑) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

(นายศิระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

บริษัท ปูนซิเมนต์ไทย จำกัด (มหาชน)

๗๒) นายสมบูรณ์...

๑๐๙) นายนนทชัย...

๑๐๙) นายพนนพชัย อุปถัมภ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๔
๑๑๐) นายนิรุฬพล คุณสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๕
๑๑๑) นายนิพนธ์วัฒน์ สาริน	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๖
๑๑๒) นายปิยะนัฐ พลมะศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๗
๑๑๓) นายพงศ์สิริ โสมเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๘
๑๑๔) นายพีรพัฒน์ กำคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๙
๑๑๕) นายภาณุพงศ์ มานิตย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๐
๑๑๖) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๑
๑๑๗) นายมนูรินทร์ พูลศิริ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒
๑๑๘) นายสิรินันท์ ทองอ้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๓
๑๑๙) นายอเนชา ทันสมัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๔
๑๒๐) นายอดิศักดิ์ ผมไผ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๕
๑๒๑) นายอนันตชัย วิสุม	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๖
๑๒๒) นายณัฐดนัย เจือละออง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗
๑๒๓) นายวรวิธ ดินัก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๘
๑๒๔) นายแสงตะวัน นະตะສັດ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๙
๑๒๕) นายยุทธพงศ์ รัตนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๐
๑๒๖) นายชัยวุฒิ ไชยชนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๑
๑๒๗) นายวิศรุต ศรีธรรมมา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๒
๑๒๘) นายพนนทกร เผือกผ่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๓
๑๒๙) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๔
๑๓๐) นางสาวณัฐภรณ์ รักทะเล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๑๙
๑๓๑) นางสาวประภาภรณ์ บุตรพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๐
๑๓๒) นางสาวนิลาวัลย์ นามพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๑
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๒
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๓
๑๓๕) นางสาวศุภมาศ ทองมาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๔
๑๓๖) นางสาวลลิตา จิตรสว่าง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๕
๑๓๗) นางสาวชไมพร เสิกภูเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๖
๑๓๘) นางสาวกฤติมาพร คำมีแก่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๗
๑๓๙) นางสาวสกลรัตน์ ภาควุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๘
๑๔๐) นางสาวกาญจนา คงคุณ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙
๑๔๑) นางสาวไพรินทร์ ศรีรูปี	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๐
๑๔๒) นางสาวทิพนันดา ฝูญปัญญา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๑
๑๔๓) นางสาวสาธิตา ปานทอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๒
๑๔๔) นางสาวอริสา ทองนวล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๓
๑๔๕) นางสาวอริยา คำคลอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๔

(นายศิริ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

๑๔๖) นางสาวบุษดาภรณ์...

๑๔๖) นางสาวชุตานกรณ์ สุนทรสนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุดารัตน์ นนท์ประสาท	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชนิกร เนียมกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลทา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปันมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาฤดี คุณนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พองดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อุระ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอริสา วิริยขันติธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิษุตา นาคผจญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิดา ยอดอินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะสุน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๑



(นายศิริระ จันท์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 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 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 Method ^[4]
8	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
9	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
10	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic 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 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



(นางริกาญจน์ จิตรสกุลไชย)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

19 Copper...

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 Method ^[4]
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
33	Formaldehyde	Distillation, Colorimetric Method ^[3]
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ^[4] 2) Iodometric Method ^[4]
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
37	Hexavalent Chromium	Filtration, Colorimetric Method ^[4]
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ^[4]
39	Lead	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
40	Manganese	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 Method ^[4]

วิมล

44 Methomy...

(นางริกาญจน์ อัครสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
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 Suspended Solids	Dried at 103-105 °C ^[4]
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ^[4]
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4]

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]

วิภา

3 Aldrin...

(นางริภาณจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
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]

วิธีทาง)

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

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]
		Equilibrium Headspace, 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]

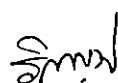


34 Chromium (III)...

(นางริกาญจน์ จิตรสกุลไธ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
57	Dieldrin	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]



(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

68 Fluorene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
74	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
75	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
76	γ -HCH	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) Cold Vapor Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]

ร.พ.ว.

84 Methanol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

แบบฟอร์มแจ้งผลการวิเคราะห์

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[4]
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
94	N-Nitrosodiphenylamine	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]

วิมล

97 Pentachlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
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, Direct Photometric Method ^[4] 2) 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 ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,24]
110	TPH (C ₈ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^[9,21]
111	TPH (C ₁₆ -C ₃₅)	Solvent Extraction, Gas Chromatographic Method ^[9,21]
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]

วิมล

114 1,1,2-Trichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
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 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]

วิฑูรย์

3 Carbon Monoxide...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานที่เกี่ยวข้อง

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ^[5] 2) Non-Dispersive Infrared Method ^[5] 3) Instrumental Analyzer Method ^[5]
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ^[5]
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
11	Opacity	Ringelmann's Method ^[2]
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[5] 2) Chemiluminescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) UV Fluorescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
16	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]

วิมล

สิ่งปลูก...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

กรมควบคุมมลพิษ

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]

วิมล

6 Cadmium...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,19,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,6,15,17] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,6,16,17] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,15,17] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8, 16,17]
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^[1,6,17] 2) Alkaline Digestion, Colorimetric Method ^[8,17]



(นางริกาญจน์ จิตรสกุลวิไล)

11 Cobalt...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

.....เรียน...../.....

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]

จิราพร

2) Soxhlet...

(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
18	Endrin	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
19	Heptachlor	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
20	Lead	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16]
21	Lindane	3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22]
22	Mercury	3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,6,18]

วิมล

2) Waste Extraction...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^[1,6,19] 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[1,6,20] 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[18] 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^[19] 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[20]
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
25	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
		1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]

วิภากร

27 Polychlorinated...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	<p>Polychlorinated biphenyls (PCBs)</p> <ul style="list-style-type: none"> - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 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 	<p>1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method^[1,9,23]</p> <p>2) Soxhlet Extraction, Gas Chromatographic Method^[10,23]</p> <p>3) Automated Soxhlet Extraction, Gas Chromatographic Method^[22,31]</p>

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
29	pH	Electrometric Method ^[29,30]
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16]
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15]

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
15	Benzo(g,h,i)perylene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
21	Butanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[12,24]
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]



(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,15,17] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,16,17]
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[8,17]
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
37	Cyanide	Extraction, Distillation, Colorimetric Method ^[26,27,28]
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
39	DDD	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

วิฑูรย์

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
41	DDT	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
42	Dibenz(a,h)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]

วิภาณี

57 Dieldrin...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[18]



(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

2) Thermal...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ^[19] 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[20] Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^[12,24]
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,23] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[23,32]

วิฑูรย์

(นางริกาญจน์ ฉัตรสกุลวิไล)

- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	<ul style="list-style-type: none"> - 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 	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
109	TPH (C ₈ - C ₁₆)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
110	TPH (C ₁₆ - C ₃₅)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

วิมล

116 2,4,6-Trichlorophenol...

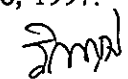
(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

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(นางริกาญจน์ ฉัตรสกุลไธ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๑๐(๑)/ ๕ ๓ ๗ ๙

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๙ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๔ กุมภาพันธ์ ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๙ ราย

- | | |
|---------------------------------|----------------------------|
| ๑) นายนคร สุขเจริญ | ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒ |
| ๒) นายบัญชา นามเขตต์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓ |
| ๓) นายอรรคพล นิยมวิทย์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗ |
| ๔) นางสาวพัชรียา หงษ์สมดี | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓ |
| ๕) นางสาวภาวนิดา สุรวงศ์ตระกูล | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔ |
| ๖) นางสาวศรณีย์ ยิ่งดี | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙ |
| ๗) นายสมโภช วันสา | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๙ |
| ๘) นายณัฐนันท์ ปานประเสริฐ | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๑๙ |
| ๙) ว่าที่ร้อยตรีภาณุพงศ์ แสนศรี | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๖ |
| ๑๐) นายมนินทร์ พูลศิริ | ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒ |
| ๑๑) นายณัฐดนัย เจือละออง | ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗ |
| ๑๒) นางสาวกาญจนา คงคุณ | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙ |
| ๑๓) นางสาวรัชนิกร เนียมกลาง | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗ |
| ๑๔) นางสาวกัญญารัตน์ ศรีนิลทา | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘ |
| ๑๕) นายศิริวัฒน์ พานิชย์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑ |
| ๑๖) นางสาวกนกภรณ์ อูระ | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕ |
| ๑๗) นางสาวจิตสุภา ประเทืองสุข | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗ |
| ๑๘) นางสาวอริสา วิริยขันติธรรม | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘ |
| ๑๙) นางสาวพนิดา ยอดอินทร์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐ |

๒. ให้เพิ่มเจ้าหน้าที่...

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- | | |
|---------------------------------|----------------------------|
| ๑) นายกาจบัณฑิต กิตติสุขภวณิชย์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๑ |
| ๒) นายภัทรพล สว่างใจธรรม์ | 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 |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ที่ อก ๐๓๑๐(๑)/๑๐๖๙ ลงวันที่ ๒๘ มกราคม ๒๕๖๔ คือในวันที่ ๒ กันยายน ๒๕๖๖ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ทำหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางริกาญจน์ นัตรสกุลวิไล)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

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)/ ๖ ๑ ๒ ๕



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒ ๓ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๐ มีนาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐
ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการ
วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการ
วิเคราะห์ จากเดิม นางสาวสรารค์มี มงคลจิรวุฒิ ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙ เป็น นางสาวธัญญธร มงคลจิรวุฒิ
ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙

ทั้งนี้ หากท่านมีความประสงค์จะยื่นคำขอใดๆ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์
ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

✓ (นายประสม ดำรงพงษ์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

วันที่ 4 เดือน สิงหาคม พ.ศ. 2566

ข้าพเจ้า () ผู้รับใบอนุญาตประกอบกิจการโรงงาน

(✓) บริษัท/ห้างหุ้นส่วนจำกัด เอแอลเอส แลбораторี กรุป (ประเทศไทย) จำกัด

ตั้งอยู่ที่เลขที่ 104 หมู่ที่ - ตรอก/ซอย พัฒนาการ 40

ถนน พัฒนาการ ตำบล/แขวง พัฒนาการ

อำเภอ/เขต สวนหลวง จังหวัด กรุงเทพมหานคร รหัสไปรษณีย์ 10250

โทรศัพท์ 02 760-3040 โทรสาร 0 2 760-3197

ได้รับทราบระเบียบกรมโรงงานอุตสาหกรรมว่าด้วยการขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน พ.ศ. 2560 โดยตลอดแล้วและยินยอม

ปฏิบัติตามระเบียบฯทุกประการ และได้แนบเอกสารต่างๆ ตามรายการเอกสารประกอบการพิจารณา (แบบ ปอ.1-1) มาพร้อมนี้

รายการขอดำเนินการ

การดำเนินการ	รายละเอียด (รายการ)				
	น้ำเสีย/น้ำทิ้ง	น้ำใต้ดิน	อากาศเสีย	สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว	ดิน
[] ขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน					
[✓] ต่ออายุห้องปฏิบัติการวิเคราะห์เอกชน	59	126	16	35	125
[✓] เปลี่ยนแปลงสารมลพิษที่วิเคราะห์ (✓) เพิ่มสารมลพิษ () ยกเลิกสารมลพิษ	-	-	12	-	-
[✓] เปลี่ยนแปลงบุคลากร (✓) เพิ่มบุคลากร (✓) ยกเลิกบุคลากร	จำนวน 38 ราย (รายละเอียดตาม แบบ ปว.1) จำนวน 2 ราย (รายละเอียดตาม แบบ ปว.1)				
[] ยกเลิกห้องปฏิบัติการวิเคราะห์เอกชน					
[] อื่นๆ ..โปรดระบุ.....					

จึงเรียนมาเพื่อโปรดพิจารณา

กวกท.
.....
เพื่อโปรดพิจารณา

ลงชื่อ

(นางทัศนีย์ เลขากุลพร)

ผู้มีอำนาจลงนามแทนนิติบุคคล
ประทับตรา (ถ้ามี)

(นายประสม ดำรงพงษ์)
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ALS Laboratory Group
(Thailand) Co., Ltd.





ที่ อก ๐๓๑๐(๓)/ ๖๔๗๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๘ มิถุนายน ๒๕๖๕

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๙ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลборาทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่
๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอลวกแดง จังหวัดระยอง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | | |
|--------------------------|---------------|--------------|
| ๑) นายเดช ช้างชน | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๒ |
| ๒) นางวิลาวัลย์ บริรักษ์ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๓ |
| ๓) นายสุพจน์ สลามเต๊ะ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๔ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | | |
|---------------------------------|---------------|--------------|
| ๑) นางสาวนฤมล บรรจงกิจ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๕ |
| ๒) นางพจนา สีดา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๖ |
| ๓) นางสาวธนิดา กุลสุริวงศ์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๗ |
| ๔) นายพิทยา ทองแดง | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๘ |
| ๕) นางชลธิชา สุนงข | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๙ |
| ๖) ว่าที่ ร.ต.รณชัย ม่วงมา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๐ |
| ๗) นายวรารุณ ทัพพา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๑ |
| ๘) นายศักดิ์รินทร์ จรัสกาย | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๒ |
| ๙) นายสุรศักดิ์ สาชิน | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๓ |
| ๑๐) นางสาวเพชรคุณ ภาภูตานนท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๔ |
| ๑๑) นายสถาพร ถาแก้ว | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๕ |
| ๑๒) นายสุทธิดำรงค์ โชคปิตินันท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๖ |

๑๓) นายวัลลภ หันไชยเนาว์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๗
๑๔) นางสาววนาลี เจริญตระกูล	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๘
๑๕) นางสาวนิดา ผดุงจิตต์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๙
๑๖) นายธนะสิทธิ์ วงศ์ไชย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๐
๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๑
๑๘) นายสัจจา เพ็ชรแสง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๒
๑๙) นายกันตภณ มณีสัมพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๓
๒๐) นางสาวจันทนีย์ โกเมนชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๔
๒๑) นายธารินทร์ อ็อกจินดา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๕
๒๒) นายศุภณัฐ พิสัยพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๖
๒๓) นายศุภชัย วงศ์สุริย์ฉาย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๗
๒๔) นายปฐมพงศ์ กรสวัสดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๘
๒๕) นายไสว ตันโพธิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๙
๒๖) นางสาวกิตติยา สัญญาอริยาภรณ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๐
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๑
๒๘) นางสาวมธุรินทร์ สิงห์เงา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๒
๒๙) นางสาวธิดารัตน์ ศิริมั่งคะโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๓
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๔
๓๑) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๕
๓๒) นายปารามศ สัตยาคุณ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๖
๓๓) นายนฤนาท ธรรมสโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๗
๓๔) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๘
๓๕) นายพชรกร อินทรเสนา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๙
๓๖) นายทิวากร เชื้อมาก	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๐
๓๗) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๑
๓๘) นายอภิชาติ วิลาศ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๒
๓๙) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๓
๔๐) นายประสานมิตร เชื้อนเพชร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๔
๔๑) นายภาณุวัฒน์ วังบง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๕
๔๒) นายสันติ ชัยชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๖
๔๓) นายสิทธิชัย แก้วเกตุ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๗
๔๔) นายทินกร กุลชาติ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ
 อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ
 ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางจินดา เตชะศรีนทร์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๘ มิ.ย. ๒๕๖๔

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓

ที่ อก ๐๓๑๐(๓)/

๖๔๗๐

ลงวันที่

๒๘

มิถุนายน

๒๕๖๔

ขอขยาสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับที่	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	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[8]
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 ^[6] 2) Instrumental Analyzer Method ^[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium – Thorin Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

น้ำใต้ดิน จำนวน 3 รายการ

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

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ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125ง.

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9. United States Environmental Protection Agency. Determination of Oxide of Nitrogen Emissions from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 7E, 2019.

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วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

สำเนา

ที่ อก ๐๓๒๐/ ๒๐๕๓

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๒ มี.ค. ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเปลี่ยนแปลงบุคลากร ของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๔ มีนาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอลำลูกเกด จังหวัดระยอง ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

ก. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- | | | |
|------------------------------|---------------|--------------|
| ๑) นางสาวเจษฎาพร ศรีบุญเรือง | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๗๑ |
| ๒) นางสาวมธุรินทร์ สิงห์เงา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๗๒ |
| ๓) นางสาววนิดา ผดุงจิตต์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๙ |
| ๔) นายศุภณัฐ พิสัยพันธ์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๖๖ |
| ๕) นายสิทธิชัย แก้วเกตุ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๘๗ |

ข. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๒ ราย

- | | | |
|------------------------------|---------------|--------------|
| ๑) นายณัฐพงษ์ เพ็งขานา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๑ |
| ๒) นางสาวกัลยวรรณ รักษ์ดี | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๒ |
| ๓) นางสาวจุฑารัตน์ สีทองกลาง | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๓ |
| ๔) นางสาวจิตสุภา ประเทืองสุข | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๔ |
| ๕) นายสรเรณู ค่อยยกสุข | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๕ |
| ๖) นายณัฐวุฒิ อภิมพมราช | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๖ |
| ๗) นายจิตรกร สีวะสา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๐๗ |
| ๘) นายสิทธิวิชญ์ 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) นายอดิศักดิ์ ตะริศุณย์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๐๐๑๒ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ที่ อก ๐๓๑๐(๓)/๖๔๗๐ ลงวันที่ ๒๘ มิถุนายน ๒๕๖๔ คือในวันที่ ๒๘ มิถุนายน ๒๕๖๗ ทั้งนี้ สามารถยื่นคำขอผ่าน
ระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรมตาม QR Code ท้ายหนังสือนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นายทวี อำพาพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



ที่ อก ๐๓๒๐/๒๕๖๕๓



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๐ พ.ย. ๒๕๖๕

เรื่อง เปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๕ ตุลาคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอปลวกแดง จังหวัดระยอง ขอเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เพิ่มขอบข่ายสารมลพิษที่วิเคราะห์ในน้ำเสีย จำนวน ๑๓ รายการ และน้ำใต้ดิน ๓ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชนที่ อก ๐๓๑๐(๓)/๖๔๗๐ ลงวันที่ ๒๘ มิถุนายน ๒๕๖๔ คือในวันที่ ๒๘ มิถุนายน ๒๕๖๗ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทวี อำพาพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

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เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบลอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๓๒๓

ที่ ออก ๐๓๒๐/๑๕๕๓

ลงวันที่

๑๐ พ.ย. ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖ รายการ
น้ำเสีย จำนวน 13 รายการ

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

น้ำใต้ดิน จำนวน 3 รายการ

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

เอกสารอ้างอิง

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington, DC : APHA, 2023



right solutions.
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ติดต่อเรา

