

ภาคผนวก ค

เอกสารประกอบการปฏิบัติตามมาตรการ
ติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

ภาคผนวก ค-1

คุณภาพอากาศจากปล่องระบาย



Analysis / Test Report

TESTING
No. 0009

Lot ID: 2220507
Date Received : Mar 02, 2022
Date Reported : Jun 23, 2022
Report Number: 2355399-1

Page 1 of 2

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Sample Number 2220507-1
Sampled Date Mar 02, 2022
Sample Description Emission from Stationary Source
Location HRS6411
Data Analysis Commenced Mar 03, 2022
Condition of Sample Extracted into one 2-L collection flask, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description										
Analyte	Sampled Time	Unit	LOD	LOQ (LOR)	Result at 7 %O ₂ at 15.3 % O ₂	Guideline		Method	Testing Location	
						(1)	(2)			
Air Testing										
Carbon Monoxide *	12:20 PM - 12:30 PM	ppm	-	1.0	251	101.1	690*	US EPA, Method 10	Bangkok	
Oxides of Nitrogen *	12:10 PM - 12:20 PM	ppm	-	1.06	24.1	9.7	120	US EPA, Method 7	Bangkok	
Sulfur dioxide *	12:10 PM - 12:40 PM	ppm	-	0.5	<0.5	<0.5	20	US EPA, Method 6	Bangkok	
Total Suspended Particulate	12:10 PM - 12:58 PM	mg/m ³	-	0.5	1.5	0.6	60	US EPA, Method 5	Bangkok	
Ambient Pressure	759	mmHg	Diameter		3.05		m	Oxygen	15.3	%
Ambient Temperature	32.0	°C	Shape		Circle			Carbon Dioxide	3.2	%
Type of Process	Combustion		Stack Temperature		117		°C	Gas Velocity	22.7	m/s
Type of Fuel	Natural Gas		Moisture		9.88		%	Flow Rate (Actual O ₂)	410658	Nm ³ /hr

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 Industry, 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)

Guideline(2) : Environmental Impact Assessment Report of B. Grimm BIP Power 1 Limited

Technical Management
Sanyong C.
Sanyong Chaimethamrong
Scientist (4)
vndunard 7-204-4717

Approved by
Kankorn Anek
Senior Manager
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10060-311/EMAL

S: Waporn_Air_Samp_02_202_09 (9/07/94)



Analysis / Test Report

TESTING
No. 0009

Lot ID: 2220507
Date Received : Mar 02, 2022
Date Reported : Jun 23, 2022
Report Number: 2355399-1

Page 2 of 2

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Sample Number 2220507-1
Sampled Date Mar 02, 2022
Sample Description Emission from Stationary Source
Location HRS6411
Data Analysis Commenced Mar 03, 2022
Condition of Sample Extracted into one 2-L collection flask, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description									
Ambient Pressure	759 mmHg	Diameter	3.05	m	Oxygen	15.3 %	Carbon Dioxide	3.2 %	Type of Process
Type of Fuel	Natural Gas	Moisture	9.88	%	Flow Rate (Actual O2)	410658 Nm3/hr			
Unit	Sampled Time	LOQ	LOQ (LOR)	Result	Guideline (1)	Guideline (2)	Method	Testing Location	
Air Testing									
Carbon Monoxide *	12:20 PM - 12:30 PM	g/s	-	13.30	-	-	Calculated	Bangkok	
Oxides of Nitrogen *	12:10 PM - 12:20 PM	g/s	-	2.10	-	12.136	Calculated	Bangkok	
Sulfur dioxide *	12:10 PM - 12:40 PM	g/s	-	<0.15	-	0.222	Calculated	Bangkok	
Total Suspended Particulate *	12:10 PM - 12:58 PM	g/s	-	0.07	-	0.311	Calculated	Bangkok	

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 Industry, 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)

Guideline(2) : Environmental Impact Assessment Report of B. Grimm BIP Power 1 Limited

Note:
This Analysis test report is reissued to supersede report No. 2223890-1 Rev no.1 Reported : Mar 14, 2022 due to revise analytical information.

Sampled By : Kriyana Seimien

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
Sanyong C.
Sanyong Chaimethamrong
Scientist (4)
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10060-311/EMAL

S: Waporn_Air_Samp_02_202_09 (9/07/94)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220510
Date Received : Mar 02, 2022
Date Reported : Jun 23, 2022
Report Number: 2355401-1

TESTING
No. 0009

Page 1 of 2

Sample Number	2220510-1
Sampled Date	Mar 02, 2022
Sample Description	Emission from Stationary Source
Location	HRS6412
Date Analysis Commenced	Mar 03, 2022
Condition of Sample	Extracted into one 2-L collection flask, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description		Result		Guideline		Method	Testing Location
Analyte	Sampled Time	Unit	LOQ (LOR)	at 7 % O ₂	at 15.2 % O ₂		
Air Testing							
Carbon Monoxide *	10:40 AM - 10:50 AM	ppm	-	1.0	189	77.5	Bangkok
Oxides of Nitrogen *	10:30 AM - 10:40 AM	ppm	-	1.06	19.0	7.8	Bangkok
Sulfur dioxide *	10:30 AM - 11:00 AM	ppm	-	0.5	<0.5	20	Bangkok
Total Suspended Particulate	10:30 AM - 11:18 AM	mg/m ³	-	0.5	1.8	0.7	Bangkok

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 Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
Guideline(2) : Environmental Impact Assessment Report of B. Grimm BIP Power 1 Limited

Technical Management

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Approved by

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220510
Date Received : Mar 02, 2022
Date Reported : Jun 23, 2022
Report Number: 2355401-1

TESTING
No. 0009

Page 2 of 2

Sample Number	2220510-1
Sampled Date	Mar 02, 2022
Sample Description	Emission from Stationary Source
Location	HRS6412
Date Analysis Commenced	Mar 03, 2022
Condition of Sample	Extracted into one 2-L collection flask, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description		Result		Guideline		Method	Testing Location
Analyte	Sampled Time	Unit	LOQ (LOR)	Emission Rate	(1)		
Air Testing							
Carbon Monoxide *	10:40 AM - 10:50 AM	g/s	-	10.30	-	Calculated	Bangkok
Oxides of Nitrogen *	10:30 AM - 10:40 AM	g/s	-	1.70	-	Calculated	Bangkok
Sulfur dioxide *	10:30 AM - 11:00 AM	g/s	-	<0.15	-	Calculated	Bangkok
Total Suspended Particulate *	10:30 AM - 11:18 AM	g/s	-	0.08	-	Calculated	Bangkok

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 Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
Guideline(2) : Environmental Impact Assessment Report of B. Grimm BIP Power 1 Limited

Note:

This Analysis test report is reissued to supersede report No. 2233894-1 Rev no.1 Reported : Mar 14, 2022 due to revise analytical information.

Sampled By : Kritsana Silavan

Remark :

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

Technical Management

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Sarenya Cholembamrong
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5 (Report)_Ar Stack_02_202.pdf (9/07/26)

ภาคผนวก ค-2

คุณภาพอากาศในบรรยากาศ



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
5, Krungthepreetha Road., Huamark, Bangkok, Thailand 10240
P/O : 181510380
Project Name : BIP1
Project Location :
Lot ID: 2220018
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2232596-IC1

Sample Description	Air Quality									
Location	ufhwaiauray (GSP 47P 0669929, 1547131)									
Parameter	Nitrogen dioxide (ppm)									
Measurement Date	Mar 01, 2022 - Mar 08, 2022									
Measurement by	Vanch Phantip									
Time	2220018-1	2220018-2	2220018-3	2220018-4	2220018-5	2220018-6	2220018-7			
12:00 PM - 01:00 PM	0.015	0.014	0.014	0.012	0.015	0.013	0.014	0.014		
01:00 PM - 02:00 PM	0.015	0.011	0.013	0.016	0.014	0.013	0.013	0.013		
02:00 PM - 03:00 PM	0.012	0.014	0.028	0.012	0.015	0.011	0.011	0.013		
03:00 PM - 04:00 PM	0.016	0.013	0.028	0.013	0.013	0.012	0.010	0.010		
04:00 PM - 05:00 PM	0.012	0.013	0.030	0.016	0.011	0.010	0.010	0.011		
05:00 PM - 06:00 PM	0.013	0.010	0.034	0.018	0.012	0.011	0.010	0.010		
06:00 PM - 07:00 PM	0.016	0.011	0.022	0.023	0.020	0.016	0.010	0.010		
07:00 PM - 08:00 PM	0.018	0.010	0.037	0.029	0.023	0.018	0.012	0.012		
08:00 PM - 09:00 PM	0.023	0.010	0.028	<0.001	0.020	0.016	0.012	0.012		
09:00 PM - 10:00 PM	0.018	0.012	0.027	0.026	0.019	0.013	0.011	0.011		
10:00 PM - 11:00 PM	0.016	0.012	0.025	0.020	0.015	0.010	0.010	0.010		
11:00 PM - 12:00 AM	0.013	0.013	0.020	0.015	0.011	0.010	0.010	0.004		
12:00 AM - 01:00 AM	0.010	0.012	0.014	0.014	0.007	0.010	0.010	0.004		
01:00 AM - 02:00 AM	0.010	0.012	0.013	0.011	0.006	0.009	0.006	0.006		
02:00 AM - 03:00 AM	0.010	0.012	0.013	0.009	0.005	0.007	0.006	0.006		
03:00 AM - 04:00 AM	0.009	0.013	0.012	0.007	0.006	0.008	0.005	0.005		
04:00 AM - 05:00 AM	0.007	0.013	0.012	0.006	0.004	0.006	0.004	0.004		
05:00 AM - 06:00 AM	0.013	0.013	0.012	0.010	0.006	0.004	0.004	0.006		
06:00 AM - 07:00 AM	0.014	0.013	0.013	0.013	0.007	0.010	0.007	0.007		
07:00 AM - 08:00 AM	0.012	0.012	0.013	0.014	0.010	0.011	0.011	0.008		
08:00 AM - 09:00 AM	0.012	0.012	0.013	0.012	0.011	0.010	0.010	0.007		
09:00 AM - 10:00 AM	0.013	0.013	0.013	0.012	0.012	0.010	0.010	0.010		
10:00 AM - 11:00 AM	0.014	0.014	0.015	0.013	0.011	0.012	0.010	0.010		
11:00 AM - 12:00 PM	0.015	0.015	0.015	0.014	0.012	0.011	0.008	0.008		
Average	0.014	0.012	0.019	0.014	0.012	0.011	0.009	0.009		
1hr - Maximum	0.023	0.015	0.037	0.029	0.023	0.018	0.014	0.014		
Standard 1hr - Average	0.170	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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10250-211 TMA



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Muang Pathum Thani District, Pathumthani Thailand 12000
P/O : 181510380
Project Name : BIP1
Project Location :
Lot ID: 2220441
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number: 2263700-IC1

Sample Number	Sample Description	Location	Date Analysis Commenced	Condition of Sample	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2220441-1	2220441-1	Air Quality	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 01 - Mar 02, 2022	0.115	0.058	757	33
2220441-2	2220441-2	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 02 - Mar 03, 2022	0.107	0.051	757	33
2220441-3	2220441-3	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 03 - Mar 04, 2022	0.111	0.047	757	33
2220441-4	2220441-4	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 04 - Mar 05, 2022	0.104	0.049	757	33
2220441-5	2220441-5	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 05 - Mar 06, 2022	0.106	0.054	757	33
2220441-6	2220441-6	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 06 - Mar 07, 2022	0.095	0.043	757	34
2220441-7	2220441-7	ufhwaiauray (GSP 47P 0659929, 154731)	Mar 10, 2022	Drawn into one glass filter paper (8x10 inch) placed in plastic bag	Mar 07 - Mar 08, 2022	0.089	0.035	757	34

Reference Method

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

Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

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

Sampled By : Vanich Phantip

Approved by

Sarakat

Sarakat Mongkoljirawat
Scientist (4)

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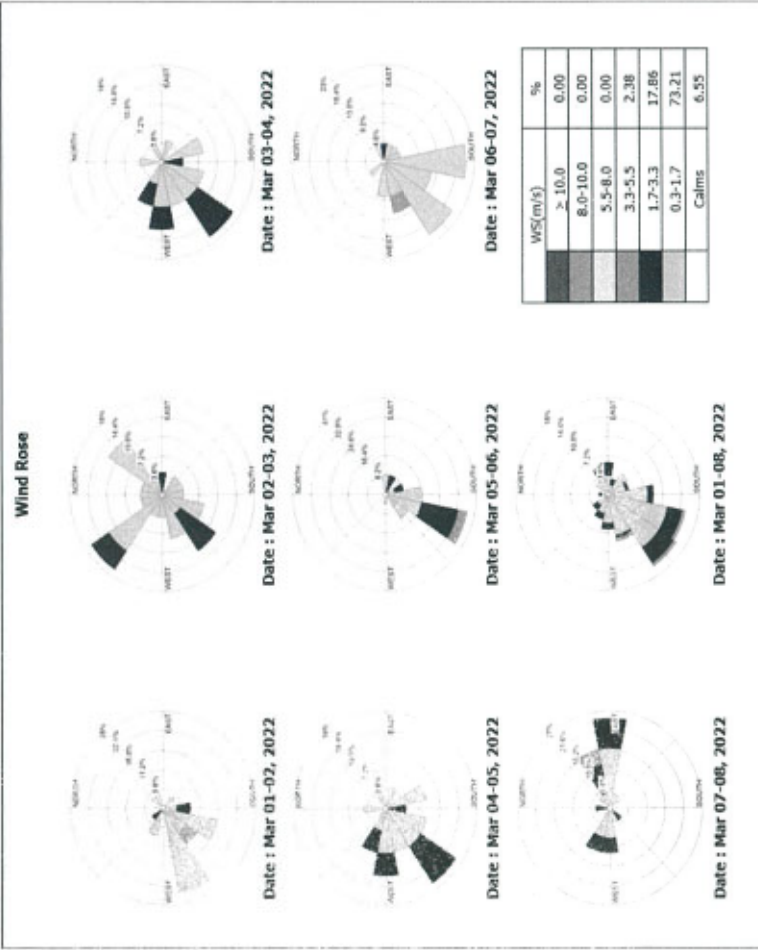


Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Banghadi Industrial Park, Banghadi Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID : 2220459
Date Received : Mar 09, 2022
Date Reported : Mar 14, 2022
Report Number : 223803-1 C1

Page 2 of 2



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Approved by

Sarayuth Jitranont
Assistant General Manager

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
5, Krungthepkreetha Road., Huamark, Bangkok Thailand 10240
P/O : 381510380
Project Name : BIP1
Project Location :

Lot ID : 2220018
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number : 2261160-1C1

Page 1 of 1

Sample Description : Air Quality
Location : อุโมงค์ระบายน้ำ (GSP 0669897, 1543257)
Parameter : Nitrogen dioxide (ppm)
Measurement Date : Mar 01, 2022 - Mar 08, 2022
Measurement by : Varich Phantipit

Time	2220018-8 Mar 01, 2022	2220018-9 Mar 02, 2022	2220018-10 Mar 03, 2022	2220018-11 Mar 04, 2022	2220018-12 Mar 05, 2022	2220018-13 Mar 06, 2022	2220018-14 Mar 07, 2022
01:00 PM - 02:00 PM	0.011	0.010	0.013	0.008	0.011	0.005	0.011
02:00 PM - 03:00 PM	0.011	0.010	0.009	0.008	0.009	0.006	0.012
03:00 PM - 04:00 PM	0.015	0.012	0.009	0.009	0.008	0.006	0.008
04:00 PM - 05:00 PM	0.011	0.012	0.009	0.011	0.008	0.007	0.013
05:00 PM - 06:00 PM	0.013	0.015	0.009	0.014	0.011	0.007	0.015
06:00 PM - 07:00 PM	0.015	0.027	0.011	0.015	0.014	0.009	0.015
07:00 PM - 08:00 PM	0.022	0.026	0.019	0.015	0.016	0.011	0.012
08:00 PM - 09:00 PM	0.017	0.027	0.022	0.017	0.020	0.013	0.009
09:00 PM - 10:00 PM	0.017	0.021	0.023	0.017	0.016	0.013	0.010
10:00 PM - 11:00 PM	0.016	0.013	0.022	0.014	0.012	0.009	0.010
11:00 PM - 12:00 AM	0.010	0.012	0.015	0.012	0.008	0.011	0.006
12:00 AM - 01:00 AM	0.007	0.011	0.010	0.011	0.005	0.011	0.007
01:00 AM - 02:00 AM	0.005	0.011	0.010	0.009	0.004	0.009	0.008
02:00 AM - 03:00 AM	0.004	0.009	0.008	0.007	0.005	0.008	0.007
03:00 AM - 04:00 AM	0.003	0.005	0.006	0.005	0.005	0.006	0.005
04:00 AM - 05:00 AM	0.004	0.005	0.008	0.005	0.003	0.004	0.006
05:00 AM - 06:00 AM	0.006	0.006	0.007	0.006	0.004	0.004	0.009
06:00 AM - 07:00 AM	0.008	0.007	0.007	0.008	0.005	0.007	0.012
07:00 AM - 08:00 AM	0.008	0.012	0.007	0.010	0.007	0.010	0.012
08:00 AM - 09:00 AM	0.006	0.013	0.006	0.010	0.008	0.010	0.012
09:00 AM - 10:00 AM	0.007	0.013	0.009	0.010	0.007	0.011	0.015
10:00 AM - 11:00 AM	0.013	0.012	0.010	0.010	0.007	0.010	0.022
11:00 AM - 12:00 PM	0.025	0.013	0.011	0.011	0.006	0.013	0.014
12:00 PM - 01:00 PM	0.013	0.010	0.010	0.012	0.005	0.014	0.015
Average	0.011	0.013	0.011	0.011	0.008	0.009	0.011
1hr - Maximum	0.025	0.027	0.023	0.017	0.020	0.014	0.022
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

Saranya Chalermbhansing
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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Muang Pathum Thani
District, Pathumthani Thailand 12000
P/O : 181510380
Project Name : BIP1
Project Location :

Lot ID: 2220441
Date Received : Mar 09, 2022
Date Reported : Mar 17, 2022
Report Number : 2263702-1C1



TESTING
No. 0009

Page 1 of 1

Sample Number	2220441-8
Sample Description	Air Quality
Location	uhtatfauusa (GPS 479 0669897, 1543257)
Date Analysis Commenced	Mar 10, 2022
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag, one quartz filter paper (8x10 inch) placed in plastic bag

Sample Number	Sample Date	Total Suspended Particulate (mg/m ³)	Particulate Matter (PM-10) (mg/m ³)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
2220441-8	Mar 01 - Mar 02, 2022	0.069	0.037	757	33
2220441-9	Mar 02 - Mar 03, 2022	0.090	0.052	757	33
2220441-10	Mar 03 - Mar 04, 2022	0.075	0.039	757	33
2220441-11	Mar 04 - Mar 05, 2022	0.081	0.043	757	33
2220441-12	Mar 05 - Mar 06, 2022	0.066	0.038	757	33
2220441-13	Mar 06 - Mar 07, 2022	0.059	0.035	757	34
2220441-14	Mar 07 - Mar 08, 2022	0.081	0.036	757	34
Guideline		0.33	0.12		

Reference Method

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

Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

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

Sampled By : Varich Prasitpit

Approved by

Sarat

Sarat Mongkolkeha
Scientist (4)

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1000-21/PMAL



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
5, Krungthepreetha Road,, Huamark, Bangkok, Bangkok Thailand 10240
P/O : 181510380
Project Name : BIP1
Project Location :

Lot ID: 2220026
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number : 2261154-1C1

Page 1 of 1

Sample Description	Air Quality
Location	uhtatfauusa (GPS 479 0669897, 1543257)
Parameter	Sulfur Dioxide (ppm)
Measurement Date	Mar 01, 2022 - Mar 08, 2022
Measurement by	Varich Prasitpit

Time	2220026-8	2220026-9	2220026-10	2220026-11	2220026-12	2220026-13	2220026-14
01:00 PM - 02:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
02:00 PM - 03:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
03:00 PM - 04:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
04:00 PM - 05:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
05:00 PM - 06:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
06:00 PM - 07:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
07:00 PM - 08:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
08:00 PM - 09:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
09:00 PM - 10:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
10:00 PM - 11:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
11:00 PM - 12:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
12:00 AM - 01:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
01:00 AM - 02:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
02:00 AM - 03:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
03:00 AM - 04:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
04:00 AM - 05:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
05:00 AM - 06:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
06:00 AM - 07:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
07:00 AM - 08:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
08:00 AM - 09:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
09:00 AM - 10:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
10:00 AM - 11:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
11:00 AM - 12:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
12:00 PM - 01:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Average	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1hr - Maximum	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Standard 1hr - Average	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Standard 24 hrs - Average	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Standard							
Reference Method	: Notification of the National Environmental Board No.10, 1995 (B.E.2538), No. 21, 2001 (B.E.2544) and No.24, 2004 (B.E.2547).						
	Reference Method : US EPA Method Part 53 and 58						

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Approved by

Sanyat

Sanyat Chakrathamrong
Scientist (4)

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1000-21/PMAL



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited

202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000

P/O : 211510489

Project Name : BIP1

Project Location :

Lot ID : 2220469

Date Received : Mar 09, 2022

Date Reported : Mar 14, 2022

Report Number : 223803-1 C1

Page 1 of 2

Sample Number : 2220469-8 to 14

Parameter : Wind Speed / Wind Direction

Location : อุโมงค์ลม (GPS 479 0669897, 1543257)

Sampling Date : Mar 01 - Mar 08, 2022

Sampling by : Varich Phansipit

Time	Mar 01 - Mar 02, 2022	Mar 03 - Mar 03, 2022	Mar 04 - Mar 04, 2022	Mar 05 - Mar 05, 2022	Mar 06 - Mar 06, 2022	Mar 07 - Mar 07, 2022	Mar 08 - Mar 08, 2022
WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)
01:00 PM - 02:00 PM	0.8 341.0 NNW	1.3 285.0 WNW	1.8 202.0 SSW	0.8 127.0 SE	1.1 185.0 S	2.3 156.0 SSE	1.5 164.0 SSE
02:00 PM - 03:00 PM	0.4 249.0 N	2.1 283.0 WNW	0.0 -	0.3 106.0 ESE	0.4 269.0 W	0.5 172.0 S	0.8 201.0 SSW
03:00 PM - 04:00 PM	0.0 -	1.5 328.0 WNW	0.9 193.0 SSW	2.6 147.0 SSE	0.6 193.0 SSW	0.7 207.0 SSW	1.0 295.0 WNW
04:00 PM - 05:00 PM	1.3 288.0 WNW	0.0 -	0.1 -	1.3 295.0 WNW	1.7 197.0 SSW	0.3 245.0 WSW	0.7 211.0 NW
05:00 PM - 06:00 PM	0.7 283.0 WNW	0.0 -	0.5 171.0 S	0.6 272.0 W	1.0 167.0 SSE	0.9 291.0 WNW	0.9 233.0 SW
06:00 PM - 07:00 PM	1.6 266.0 W	0.0 -	0.3 166.0 SSE	0.3 227.0 SW	0.3 146.0 SE	1.6 139.0 SE	0.8 194.0 S
07:00 PM - 08:00 PM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.7 200.0 SSW	0.2 -
08:00 PM - 09:00 PM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
09:00 PM - 10:00 PM	0.7 201.0 SSW	1.6 210.0 SSW	0.8 183.0 SSE	0.0 -	0.3 164.0 SSE	0.0 -	0.0 -
10:00 PM - 11:00 PM	0.4 136.0 SE	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.6 221.0 SW
11:00 PM - 12:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.2 -
12:00 AM - 01:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
01:00 AM - 02:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
02:00 AM - 03:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
03:00 AM - 04:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
04:00 AM - 05:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
05:00 AM - 06:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
06:00 AM - 07:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	1.8 296.0 WNW
07:00 AM - 08:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
08:00 AM - 09:00 AM	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
09:00 AM - 10:00 AM	0.7 131.0 SE	0.0 -	0.3 133.0 SE	0.0 -	2.7 166.0 SSE	0.0 -	1.0 318.0 NW
10:00 AM - 11:00 AM	0.5 278.0 W	0.0 -	0.3 284.0 WSW	0.0 -	0.6 129.0 SE	3.1 148.0 SSE	0.1 -
11:00 AM - 12:00 PM	0.7 190.0 S	1.0 174.0 S	0.6 56.0 NE	0.0 -	0.6 195.0 SSW	0.9 163.0 SSE	0.8 85.0 E
12:00 PM - 01:00 PM	0.2 -	0.0 -	0.4 182.0 S	2.0 236.0 SW	2.4 133.0 SE	0.7 227.0 SW	0.4 177.0 S

Reference Method : Cup Anemometer & Anemometer Vane Method

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Approved by

Sarayuth Jitranont
Assistant General Manager

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Approved by

Sarayuth Jitranont
Assistant General Manager



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited

202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000

P/O : 211510489

Project Name : BIP1

Project Location :

Lot ID : 2220469

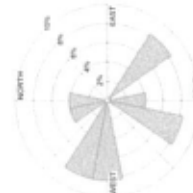
Date Received : Mar 09, 2022

Date Reported : Mar 14, 2022

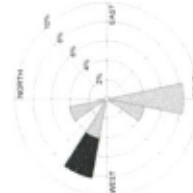
Report Number : 223803-1 C1

Page 2 of 2

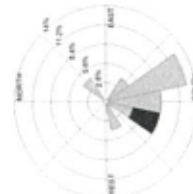
Wind Rose



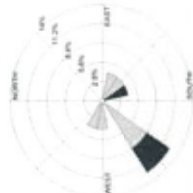
Date : Mar 01-02, 2022



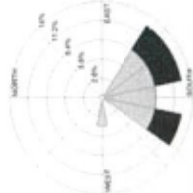
Date : Mar 02-03, 2022



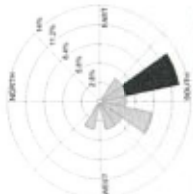
Date : Mar 03-04, 2022



Date : Mar 04-05, 2022



Date : Mar 05-06, 2022



Date : Mar 06-07, 2022

WS (m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	5.96
0.3-1.7	34.52
Calms	59.52

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Analysis / Test Report

Analysis / Test Report



Client : B. Green BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani
District, Pathumthani Thailand 12000

P/O : 181510380

Project Name : BIP1

Project Location :

Page 1 of 1

Sample Description	Air Quality											
Location	ultra-sun-an(gma (GPS 47P 0666155, 15-46931)											
Parameter	Nitrogen dioxide (ppm)											
Measurement Date	Mar 01, 2022 - Mar 08, 2022											
Measurement by	Vaich Pharmacjit											
Time	22/0018-15	22/0018-16	22/0018-17	22/0018-18	22/0018-19	22/0018-20	22/0018-21					
	Mar 01, 2022	Mar 02, 2022	Mar 03, 2022	Mar 04, 2022	Mar 05, 2022	Mar 06, 2022	Mar 07, 2022					
10:00 AM - 11:00 AM	0.021	0.014	0.012	0.016	0.031	0.035	0.024					
11:00 AM - 12:00 PM	0.022	0.016	0.017	0.050	0.055	0.049	0.052					
12:00 PM - 01:00 PM	0.024	0.054	0.094	0.036	0.021	0.057	0.056					
01:00 PM - 02:00 PM	0.052	0.047	0.069	0.076	0.026	0.051	0.055					
02:00 PM - 03:00 PM	0.033	0.042	0.043	0.072	0.063	0.047	0.051					
03:00 PM - 04:00 PM	0.027	0.037	0.021	0.067	0.062	0.043	0.057					
04:00 PM - 05:00 PM	0.067	0.040	0.026	0.056	0.050	0.037	0.049					
05:00 PM - 06:00 PM	0.084	0.044	0.072	0.042	0.038	0.037	0.057					
06:00 PM - 07:00 PM	0.082	0.059	0.077	0.035	0.057	0.029	0.040					
07:00 PM - 08:00 PM	0.055	0.067	0.063	0.026	0.040	0.057	0.036					
08:00 PM - 09:00 PM	0.047	0.070	0.049	0.026	0.036	0.049	0.038					
09:00 PM - 10:00 PM	0.037	0.065	0.067	0.033	0.037	0.016	0.016					
10:00 PM - 11:00 PM	0.026	0.055	0.026	0.027	0.029	0.050	0.028					
11:00 PM - 12:00 AM	0.032	0.053	0.033	0.040	0.034	0.028	0.016					
12:00 AM - 01:00 AM	0.027	0.038	0.027	0.039	0.031	0.032	0.018					
01:00 AM - 02:00 AM	0.025	0.024	0.026	0.032	0.029	0.036	0.019					
02:00 AM - 03:00 AM	0.023	0.019	0.023	0.021	0.024	0.029	0.017					
03:00 AM - 04:00 AM	0.010	0.013	0.020	0.022	0.027	0.025	0.021					
04:00 AM - 05:00 AM	0.016	0.017	0.014	0.020	0.021	0.018	0.026					
05:00 AM - 06:00 AM	0.016	0.017	0.010	0.023	0.021	0.026	0.024					
06:00 AM - 07:00 AM	0.021	0.021	0.055	0.024	0.023	0.034	0.025					
07:00 AM - 08:00 AM	0.023	0.022	0.051	0.023	0.028	0.032	0.018					
08:00 AM - 09:00 AM	0.029	0.024	0.057	0.018	0.028	0.031	0.021					
09:00 AM - 10:00 AM	0.016	0.016	0.049	0.034	0.025	0.036	0.034					
Average	0.034	0.036	0.042	0.036	0.035	0.037	0.033					
1hr - Maximum	0.084	0.070	0.094	0.076	0.063	0.057	0.057					
Standard 1hr - Average	0.170	0.170	0.170	0.170	0.170	0.170	0.170					
Standard Reference Method	: Notification of the National Environment Board No. 33, 2009 (B.E. 2552).											
	: US EPA Method Part 50 App. F (Chemiluminescence)											

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Approved by

Saranya C.
Saranya Chalermtamron
Scientist (4)

Saratat Mongkornirawat
Scientist (4)

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Year	Population	Population Density	Population Growth Rate	Population Growth Rate (per 1,000)
1990	1,000,000	100	1.0%	10
2000	1,200,000	120	2.0%	20
2010	1,400,000	140	3.0%	30
2020	1,600,000	160	4.0%	40
2030	1,800,000	180	5.0%	50
2040	2,000,000	200	6.0%	60
2050	2,200,000	220	7.0%	70
2060	2,400,000	240	8.0%	80
2070	2,600,000	260	9.0%	90
2080	2,800,000	280	10.0%	100
2090	3,000,000	300	11.0%	110
2100	3,200,000	320	12.0%	120

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
S, Krungthepreetha Road., Huamark, Bangkok, Bangkok Thailand 10240
P/O : 181510380
Project Name : BIP1
Project Location :
Lot ID: 2220026
Date Received : Mar 09, 2022
Date Reported : Mar 15, 2022
Report Number: 2261156-1C1

Page 1 of 1

Sample Description Location Parameter Measurement Date Measurement by	Air Quality Sulfur Dioxide (ppm) Mar 01, 2022 - Mar 08, 2022 Varich Phantipit									
	Time	2220026-15	2220026-16	2220026-17	2220026-18	2220026-19	2220026-20	2220026-21	2220026-22	2220026-23
10:00 AM - 11:00 AM 11:00 AM - 12:00 PM 12:00 PM - 01:00 PM 01:00 PM - 02:00 PM 02:00 PM - 03:00 PM 03:00 PM - 04:00 PM 04:00 PM - 05:00 PM 05:00 PM - 06:00 PM 06:00 PM - 07:00 PM 07:00 PM - 08:00 PM	10:00 AM - 11:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	11:00 AM - 12:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	12:00 PM - 01:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	01:00 PM - 02:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	02:00 PM - 03:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	03:00 PM - 04:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	04:00 PM - 05:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	05:00 PM - 06:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	06:00 PM - 07:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	07:00 PM - 08:00 PM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
08:00 PM - 09:00 AM 09:00 AM - 10:00 AM 10:00 AM - 11:00 AM 11:00 AM - 12:00 AM 12:00 AM - 01:00 AM 01:00 AM - 02:00 AM 02:00 AM - 03:00 AM 03:00 AM - 04:00 AM 04:00 AM - 05:00 AM 05:00 AM - 06:00 AM	08:00 PM - 09:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	09:00 AM - 10:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	10:00 AM - 11:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	11:00 AM - 12:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	12:00 AM - 01:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	01:00 AM - 02:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	02:00 AM - 03:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	03:00 AM - 04:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	04:00 AM - 05:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	05:00 AM - 06:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	06:00 AM - 07:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
07:00 AM - 08:00 AM 08:00 AM - 09:00 AM 09:00 AM - 10:00 AM Average 1hr - Maximum Standard 1hr - Average Standard 24 hrs - Average	07:00 AM - 08:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	08:00 AM - 09:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	09:00 AM - 10:00 AM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Average	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	1hr - Maximum	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Standard 1hr - Average	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Standard 24 hrs - Average	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Standard	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Reference Method	Notification of the National Environment Board No.10, 1995 (B.E.2538), No. 21, 2001 (B.E.2544) and No.24, 2004 (B.E.2547).								
	Reference Method	US EPA Method Part 53 and 58								

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Approved by

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Scientist (4)

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Life Sciences

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18255-J1 (04/20)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangladi Industrial Park, Bangladi Sub-district, Mueang Pathum Thani District, Pathumthani Thailand 12000
P/O : 211510469
Project Name : BIP1
Project Location :
Lot ID: 2220469
Date Received : Mar 09, 2022
Date Reported : Mar 14, 2022
Report Number: 2233003-1 C1

Page 1 of 2

Sample Number Parameter Location Sampling Date Sampling by	2220469-15 to 21 Wind Speed / Wind Direction uhsauravajnao (GPS 479 066155, 1546931) Mar 01 - Mar 08, 2022 Varich Phantipit																		
	Time		Mar 01 - Mar 02, 2022		Mar 03 - Mar 04, 2022		Mar 05 - Mar 06, 2022		Mar 07 - Mar 08, 2022		Mar 09 - Mar 10, 2022		Mar 11 - Mar 12, 2022		Mar 13 - Mar 14, 2022		Mar 15 - Mar 16, 2022		
	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)	WS (m/s)	WD (deg)	WS (m/s)	WD (deg)	
	10:00 AM - 11:00 AM	0.4	347.0 NW	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	11:00 AM - 12:00 PM	0.1	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	12:00 PM - 01:00 PM	0.0	-	1.1	207.0 SSW	1.1	236.0 SW	0.0	-	0.0	-	1.0	208.0 SSW	0.7	235.0 SW	1.1	287.0 WNW	0.0	-
	01:00 PM - 02:00 PM	0.0	-	1.4	210.0 SSW	0.0	-	0.1	-	0.3	260.0 W	2.9	227.0 SW	0.9	274.0 W	0.9	274.0 W	0.0	-
	02:00 PM - 03:00 PM	0.0	-	0.5	229.0 SW	0.3	201.0 SSW	0.0	-	1.1	224.0 SW	0.5	233.0 SW	2.1	164.0 SSE	1.1	164.0 SSE	0.0	-
	03:00 PM - 04:00 PM	0.3	143.0 SE	0.0	-	0.0	-	0.9	225.0 SW	1.5	124.0 SE	1.6	261.0 W	1.0	260.0 SSW	0.0	-	0.0	-
	04:00 PM - 05:00 PM	0.0	-	0.0	-	1.4	277.0 W	1.7	214.0 SW	0.4	320.0 NW	0.0	-	1.0	339.0 WNW	2.8	200.0 SSW	0.0	-
	05:00 PM - 06:00 PM	0.5	281.0 W	0.0	-	0.0	-	0.9	219.0 SW	0.4	320.0 NW	0.0	-	1.1	301.0 WNW	2.4	186.0 W	0.0	-
	06:00 PM - 07:00 PM	0.9	194.0 SSW	0.0	-	0.0	-	1.7	180.0 S	5.0	0.0	-	1.3	500.0 N	0.4	332.0 NNW	0.0	-	
	07:00 PM - 08:00 PM	0.2	-	0.0	-	0.0	-	1.0	223.0 SW	0.3	500.0 N	0.0	-	0.0	-	2.0	202.0 SSW	0.0	-
	08:00 PM - 09:00 PM	0.0	-	0.0	-	0.0	-	0.0	-	0.3	312.0 NW	1.0	255.0 WSW	3.4	58.0 ENE	0.0	-	0.0	-
	09:00 PM - 10:00 PM	1.0	201.0 SSW	0.0	-	0.0	-	0.0	-	1.4	296.0 WSW	0.0	-	0.0	-	0.0	-	0.0	-
	10:00 PM - 11:00 PM	0.0	-	0.0	-	1.2	188.0 S	0.4	264.0 W	1.2	296.0 WNW	0.0	-	0.0	-	0.0	-	0.0	-
	11:00 PM - 12:00 AM	0.4	240.0 WSW	0.0	-	0.0	-	0.6	196.0 SSW	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	12:00 AM - 01:00 AM	0.5	345.0 NNW	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
	01:00 AM - 02:00 AM	0.0	-	0.0	-	0.0	-	0.0	-	0.5	264.0 W	0.0	-	0.0	-	0.0	-	0.0	-
02:00 AM - 03:00 AM	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	
03:00 AM - 04:00 AM	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	
04:00 AM - 05:00 AM	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	
05:00 AM - 06:00 AM	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	
06:00 AM - 07:00 AM	0.0	-	0.0	-	0.0	-	0.1	-	0.0	-	0.0	-	0.0	-	0.0	-	0.4	67.0 ENE	
07:00 AM - 08:00 AM	0.0	-	0.0	-	0.0	-	0.3	227.0 SW	0.0	-	0.0	-	0.0	-	0.0	-	0.3	5.0 N	
08:00 AM - 09:00 AM	0.0	-	0.0	-	0.0	-	0.2	-	0.8	229.0 SW	0.0	-	0.0	-	0.0	-	0.5	26.0 NNE	
09:00 AM - 10:00 AM	0.8	234.0 SW	0.0	-	0.0	-	0.6	233.0 SW	0.3	263.0 W	0.0	-	0.0	-	0.0	-	0.2	-	

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18255-J1 (04/20)

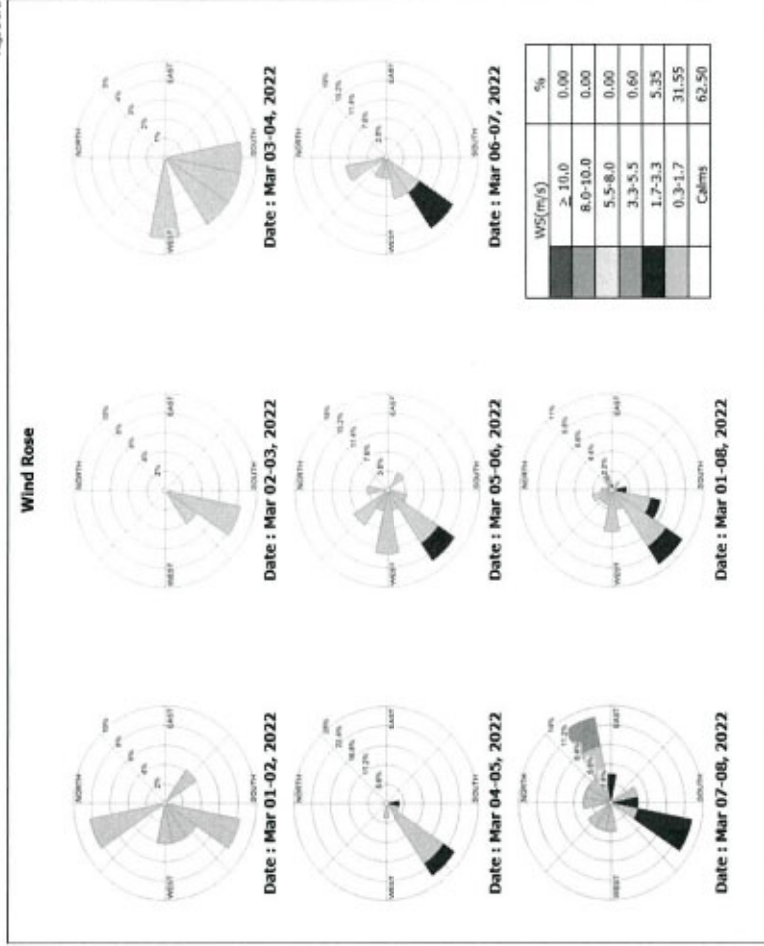


Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangladi Industrial Park, Bangladi Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 2115/0489
Project Name : BIP1
Project Location :

Lot ID : 2220469
Date Received : Mar 09, 2022
Date Reported : Mar 14, 2022
Report Number : 2233803-1 C1

Page 2 of 2



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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangladi Industrial Park, Bangladi Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 2115/0489
Project Name : BIP1
Project Location :

Lot ID : 2220523
Date Received : Mar 09, 2022
Date Reported : Mar 14, 2022
Report Number : 2233904-1

Page 1 of 2

Sample Number : 2220523-1 to 7
Parameter : Wind Speed / Wind Direction
Location : uksurufuttsam (GPS 479 0668972, 1545504)
Sampling Date : Mar 01 - Mar 08, 2022
Sampling by : Varich Phantipit

Time	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)	WS (m/s)	WD (deg)
10:00 AM - 11:00 AM	1.2	255.0 WSW	0.0	-	0.9	262.0 W	1.6	222.0 SW	0.7	241.0 WSW	0.4	210.0 SSW	0.2	-	-	-
11:00 AM - 12:00 PM	1.7	256.0 WSW	1.6	351.0 N	0.4	234.0 SW	2.0	32.0 NNE	0.4	228.0 SW	0.5	188.0 S	0.7	241.0 WSW	0.4	204.0 SSW
12:00 PM - 01:00 PM	1.2	47.0 NE	1.7	234.0 SW	1.0	2.0 N	1.8	249.0 WSW	0.7	252.0 WSW	0.6	243.0 WSW	0.4	204.0 SSW	-	-
01:00 PM - 02:00 PM	1.8	187.0 S	2.1	210.0 SSW	1.3	219.0 SW	0.8	100.0 E	0.5	265.0 W	0.3	177.0 S	1.0	254.0 WSW	-	-
02:00 PM - 03:00 PM	1.2	81.0 E	0.6	279.0 W	1.6	176.0 S	0.4	156.0 SE	0.8	220.0 SW	0.5	179.0 S	0.8	275.0 W	-	-
03:00 PM - 04:00 PM	1.2	46.0 NE	1.7	318.0 NW	0.4	254.0 WSW	0.6	219.0 SW	1.0	226.0 SW	0.3	200.0 SSW	0.5	267.0 W	-	-
04:00 PM - 05:00 PM	3.3	239.0 WSW	2.0	250.0 WSW	0.4	228.0 SW	0.3	244.0 WSW	0.4	270.0 W	0.3	239.0 WSW	0.7	260.0 W	-	-
05:00 PM - 06:00 PM	2.5	246.0 WSW	0.4	248.0 WSW	0.6	250.0 WSW	0.5	247.0 WSW	0.5	217.0 SW	0.0	-	0.3	306.0 NW	-	-
06:00 PM - 07:00 PM	1.1	261.0 W	0.5	39.8 NE	0.5	221.0 SW	0.6	196.0 SSW	0.5	237.0 SW	8.0	-	0.8	290.0 W	-	-
07:00 PM - 08:00 PM	2.1	246.0 WSW	1.0	31.0 NNE	0.6	254.0 WSW	0.4	217.0 SW	0.3	211.0 SSW	1.0	222.0 SW	1.0	233.0 SW	-	-
08:00 PM - 09:00 PM	2.3	239.0 WSW	0.5	200.0 SSW	1.0	211.0 SSW	0.5	243.0 WSW	0.0	-	1.5	200.0 SSW	0.5	234.0 SW	-	-
09:00 PM - 10:00 PM	2.5	251.0 WSW	0.7	188.0 SSW	0.4	238.0 SW	0.3	253.0 WSW	0.4	214.0 SW	0.6	226.0 SW	0.3	259.0 W	-	-
10:00 PM - 11:00 PM	1.5	229.0 SW	0.7	211.0 SSW	0.5	243.0 WSW	0.2	-	0.8	221.0 SW	0.4	213.0 SSW	0.7	49.0 NE	-	-
11:00 PM - 12:00 AM	1.9	213.0 SSW	0.4	247.0 WSW	1.0	233.0 SW	0.6	215.0 SW	0.6	209.0 SSW	0.8	217.0 SW	0.5	32.0 NNE	-	-
12:00 AM - 01:00 AM	2.5	219.0 SW	0.0	-	0.3	225.0 SW	1.0	228.0 SW	0.6	196.0 SSW	0.3	304.0 NW	0.7	46.0 ENE	-	-
01:00 AM - 02:00 AM	2.7	232.0 SW	0.0	-	0.4	252.0 WSW	0.3	233.0 SW	0.4	196.0 SSW	0.5	307.0 NW	0.5	93.0 E	-	-
02:00 AM - 03:00 AM	2.8	175.0 S	0.0	-	0.3	251.0 WSW	0.4	221.0 SW	0.6	204.0 SSW	0.6	228.0 SW	0.4	310.0 NW	-	-
03:00 AM - 04:00 AM	2.5	228.0 SW	0.3	218.0 SW	0.6	253.0 WSW	0.3	229.0 WSW	0.3	223.0 SW	0.4	237.0 WSW	0.4	9.0 N	-	-
04:00 AM - 05:00 AM	0.0	-	0.0	-	0.5	247.0 WSW	0.7	88.0 E	0.0	-	0.8	265.0 W	0.3	280.0 W	-	-
05:00 AM - 06:00 AM	0.0	-	0.4	260.0 W	0.7	63.0 ENE	0.5	165.0 SE	0.0	-	0.3	248.0 WSW	0.0	-	-	-
06:00 AM - 07:00 AM	0.0	-	0.6	348.0 NW	0.3	86.0 E	1.0	79.0 E	0.0	-	0.5	96.0 NE	0.0	-	-	-
07:00 AM - 08:00 AM	0.0	-	0.0	-	0.5	69.0 ENE	1.5	94.0 E	0.4	78.0 ENE	0.4	76.0 ENE	0.2	-	-	-
08:00 AM - 09:00 AM	0.0	-	0.5	31.0 NNE	1.0	96.0 E	0.4	66.0 ENE	0.6	249.0 WSW	0.7	87.0 ENE	0.6	39.0 NE	-	-
09:00 AM - 10:00 AM	0.0	-	1.6	299.0 WNW	1.3	72.0 ENE	0.6	234.0 SW	1.0	264.0 W	1.0	88.0 E	0.4	37.0 NE	-	-

Reference Method : Cup Anemometer & Anodized Aluminum Vane Method

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Sarayuth Jitrantorn
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Analysis / Test Report

Client : B. Grimm BEP Power 1 Limited

202, Bangladi Industrial Park, Bangladi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000

P/O : 211510489

Project Name : BEP1

Project Location :

Lot ID : 2220523

Date Received : Mar 09, 2022

Date Reported : Mar 14, 2022

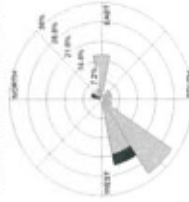
Report Number : 2233904-1

Page 2 of 2

Wind Rose



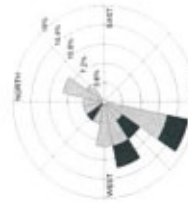
Date : Mar 01-02, 2022



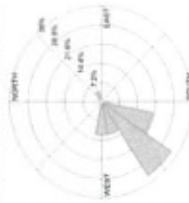
Date : Mar 04-05, 2022



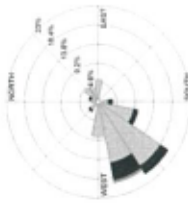
Date : Mar 07-08, 2022



Date : Mar 02-03, 2022



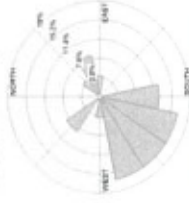
Date : Mar 05-06, 2022



Date : Mar 01-08, 2022



Date : Mar 03-04, 2022



Date : Mar 06-07, 2022

WS(m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.60
1.7-3.3	10.11
0.3-1.7	79.60
Calm	13.69

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Approved by

Sanyuth Uthairont

Assistant General Manager

ภาคผนวก ค-3

คุณภาพน้ำทิ้ง



Project Location:

TESTING
No. 0009

Liste Reported : 2011-04-24, 2011-04-24
Report Number : 2187905-1

Page 1 of 1

Sample Number	21151240-1						
Sampled Date	Jan 17, 2022 9:10 AM						
Sample Description	Wastewater						
Location	slaini-vikarun'sinsunrs (Retention Pond)						
Date Analysis Commenced	Jan 18, 2022						
Condition of Sample	Contained in one amber glass bottle, three plastic bottles and two BOD 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	<2	≤20	Based on APHA (2017), §210 B	Bangkok
COD	mg/L	1.5	5	49	≤120	Based on APHA (2017), §220 D	Bangkok
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), §520 B	Bangkok
pH at 25 degree C		-	-	8.1	5.5-9.0	Based on APHA (2017), §500-H (B)	Bangkok
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	APHA (2017), §500-C(F)	Bangkok
Temperature *	Degree C	-	-	29.4	≤40	Based on APHA (2017), §250 B	Bangkok
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	1308	≤3000	Based on APHA (2017), §2540 C	Bangkok
Total Suspended Solids Dried at 103±0.5 degree C	mg/L	-	5	7	≤50	Based on APHA (2017), §2540 D	Bangkok

Guideline: Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and Effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Remark:

- LOQ
- Limit of Detection
- " c "
- Lower than LOQ (Limit of Quantization) / LOR (Limit of Reporting)
- Analytical method is valid and included in scope of Accreditation ISO/IEC 17025.

Siriluk P.
Siriluk Puengpang

Approved by

Kandikorn Anek
Senior Manager

หมายเลข 7-204-0-6111

7-204-34720

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CONCLUSIONS

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Project Location:

Date Reported : Jan 27, 2008
Report Number : 2187905-2

Page 1 of 1

Sample Number	21151240-1						
Sample Date	Jan 17, 2022 9:10 AM						
Sample Description	Wastewater						
Location	สายน้ำทิ้งจากถังเก็บ (Retention Pond)						
Date Analysis Commenced	Jan 18, 2022						
Condition of Sample	Contained in one amber glass bottle, three plastic bottles and two BOD bottles, sample containers comply to pretreatment + preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Dissolved Oxygen	mg/L	-	0.1	6.2	No Standard	Based on APHA (2017), 4500-O (C)	Bangkok
Flow rate	m3/hr	-	-	30	No Standard	Flow meter	Bangkok

Guideline: Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).
Smolled By : Wirat Chansara

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantization) / LOR (Limit of Reporting)

Approved by

Siriluk Puengpang
Supervisor

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2213382
Date Received : Feb 09, 2022
Date Reported : Feb 15, 2022
Report Number : 2218517-1

Page 1 of 1

Sample Number	2213382-1	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Sampled Date	Feb 09, 2022 10:00 AM							
Sample Description	Wastewater							
Location	พื้นที่เก็บน้ำทิ้ง (Retention Pond)							
Date Analysis Commenced	Feb 10, 2022							
Condition of Sample	Contained in one amber glass bottle, three plastic bottles and two BOD bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)							
Analyte								
Water Testing								
BOD (5 days at 20 degree C)	mg/L	-	2	<2		≤20	Based on APHA (2017), 5210 B	Bangkok
COD	mg/L	1.5	5	62		≤120	Based on APHA (2017), 5220 D	Bangkok
Oil & Grease	mg/L	-	3	<3		≤5	Based on APHA (2017), 5520 B	Bangkok
pH at 25 degree C		-	-	8.2		5.5-9.0	Based on APHA (2017), 4500-H (B)	Bangkok
Residual Free Chlorine *	mg/L	-	0.1	<0.1		≤1.0	APHA (2017), 4500-Cl(F)	Bangkok
Temperature *	Degree C	-	-	30.1		≤40	Based on APHA (2017), 2550 B	Bangkok
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1612		≤3000	Based on APHA (2017), 2540 C	Bangkok
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	6		≤50	Based on APHA (2017), 2540 D	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Wirat Chaiyana

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

Siriluk P.
Supervisor
vtdunwatt 2-204-4720

Approved by

Kanokorn Anuk
Senior Manager
vtdunwatt 2-204-n-6111

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5 Reports, all Co. Ltd (S.07M)



Analysis / Test Report

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202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2213382
Date Received : Feb 09, 2022
Date Reported : Feb 15, 2022
Report Number : 2218517-2

Page 1 of 1

Sample Number	2213382-1	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Sampled Date	Feb 09, 2022 10:00 AM							
Sample Description	Wastewater							
Location	พื้นที่เก็บน้ำทิ้ง (Retention Pond)							
Date Analysis Commenced	Feb 10, 2022							
Condition of Sample	Contained in one amber glass bottle, three plastic bottles and two BOD bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)							
Analyte								
Water Testing								
Dissolved Oxygen	mg/L	-	0.1	6.9		No Standard	Based on APHA (2017), 4500-O (C)	Bangkok
Flow rate	m3/hr	-	-	15		No Standard	Flow meter	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Wirat Chaiyana

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

Approved by

Siriluk P.
Supervisor

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Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location:

Analysis / Test Report

TESTING
No.0009

Lot ID: 2220528
Date Received : Mar 16, 2022
Date Reported : Mar 23, 2022
Report Number : 2233907-1

Page 1 of 1

Sample Number	2220528-1						
Sampled Date	Mar 16, 2022 10:55 AM						
Sample Description	Wastewater						
Location	อุตสาหกรรม/โรงงาน (Retention Pond)						
Date Analysis Commenced	Mar 17, 2022						
Condition of Sample	Contained in two BOD bottles, three plastic bottles and one amber glass bottle, 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	<2	≤20	Based on APHA (2017), 5210 B	Bangkok
COD	mg/L	1.5	5	31	≤120	Based on APHA (2017), 5220 D	Bangkok
Oil & Grease	mg/L	-	3	3	≤5	Based on APHA (2017), 5520 B	Bangkok
pH at 25 degree C	-	-	-	8.2	5.5-9.0	Based on APHA (2017), 4500-H (B)	Bangkok
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	APHA (2017), 4500-ClF	Bangkok
Temperature *	Degree C	-	-	33.0	≤40	Based on APHA (2017), 2550 B	Bangkok
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1604	≤3000	Based on APHA (2017), 2540 C	Bangkok
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	5	≤50	Based on APHA (2017), 2540 D	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Remark :
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- "C" : Lower than LOQ (Limit of Quantitation) / LOQ (Limit of Reporting)
- Analyte(s) marked * were not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Siriluk P.
Siriluk Pungpang
Supervisor

วิบูลย์ ๒๐๒-๔-๔๗๒๐

Approved by

Karnsorn Anuk
Senior Manager

วิบูลย์ ๒๐๒-๔-๔๗๒๐

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Client : B. Grimm BTP Power 1 Limited
202, Bangkok Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location:

Analysis / Test Report

Lot ID: 2220528
Date Received : Mar 16, 2022
Date Reported : Mar 23, 2022
Report Number : 2233907-2

Page 1 of 1

Sample Number	2220528-1						
Sampled Date	Mar 16, 2022 10:55 AM						
Sample Description	Wastewater						
Location	อุตสาหกรรม/โรงงาน (Retention Pond)						
Date Analysis Commenced	Mar 17, 2022						
Condition of Sample	Contained in two BOD bottles, three plastic bottles and one amber glass bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Dissolved Oxygen	mg/L	-	0.1	7.1	No Standard	Based on APHA (2017), 4500-O (C)	Bangkok
Flow rate	m ³ /hr	-	-	17	No Standard	Flow meter	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Remark :
- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantitation) / LOQ (Limit of Reporting)

Approved by

Siriluk P.
Siriluk Pungpang
Supervisor

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Analysis / Test Report

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Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2234718
Date Received : Apr 07, 2022
Date Reported : Apr 18, 2022
Report Number : 2262728-1

Page 1 of 1

Sample Number	2234718-1						
Sample Date	Apr 07, 2022 1:30 PM						
Sample Description	Wastewater						
Location	อุตสาหกรรมโรงงาน (Retention Pond)						
Date Analysis Commenced	Apr 08, 2022						
Condition of Sample	Contained in one amber glass bottle, two BOD bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 degree C)	mg/L	-	2	2	≤20	Based on APHA (2017), 5210 B	Bangkok
COD	mg/L	1.5	5	37	≤120	Based on APHA (2017), 5220 D	Bangkok
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Bangkok
pH at 25 degree C	-	-	-	8.1	5.5-9.0	Based on APHA (2017), 4500-H (H)	Bangkok
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	APHA (2017), 4500-Cl(F)	Bangkok
Temperature *	Degree C	-	-	32.7	≤40	Based on APHA (2017), 2550 B	Bangkok
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	2004	≤3000	Based on APHA (2017), 2540 C	Bangkok
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	8	≤50	Based on APHA (2017), 2540 D	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Wirat Chanana

Remark :
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- Analyte(s) marked * : were not included in scope of Accreditation ISO/IEC 17025.

Technical Management

Approved by
Narin Saiseng
Supervisor
vmsdusara@-204-s-4715

Approved by
Kankolom Anok
Senior Manager
vmsdusara@-204-s-4715

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
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Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2234718
Date Received : Apr 07, 2022
Date Reported : Apr 18, 2022
Report Number : 2262728-2

Page 1 of 1

Sample Number	2234718-1						
Sample Date	Apr 07, 2022 1:30 PM						
Sample Description	Wastewater						
Location	อุตสาหกรรมโรงงาน (Retention Pond)						
Date Analysis Commenced	Apr 08, 2022						
Condition of Sample	Contained in one amber glass bottle, two BOD bottles and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Dissolved Oxygen	mg/L	-	0.1	8.1	No Standard	Based on APHA (2017), 4500-O (C)	Bangkok
Flow rate	m3/hr	-	-	20	No Standard	Flow meter	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Wirat Chanana

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

Approved by

Approved by
Narin Saiseng
Supervisor

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Analysis / Test Report

Lot ID: 2254493
Date Received : May 12, 2022
Date Reported : May 20, 2022
Report Number : 2305266-1

Client : B. Grimm BIP Power 1 Limited
202, Bangkok Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Page 1 of 1

Sample Number	2254493-1						
Sampled Date	May 12, 2022 11:35 AM						
Sample Description	Wastewater						
Location	sanitukitsaasansana (Retention Pond)						
Date Analysis Commenced	May 13, 2022						
Condition of Sample	Contained in two 800 bottles, one amber glass bottle and three plastic bottles, sample containers comply to pretreatment + preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 degree C)	mg/L	-	2	<2	≤20	Based on APHA (2017), 5210 B	Bangkok
COD	mg/L	1.5	5	39	≤120	Based on APHA (2017), 5220 D	Bangkok
Oil & Grease	mg/L	-	3	<3	≤5	Based on APHA (2017), 5520 B	Bangkok
pH at 25 degree C	-	-	-	8.1	5.5-9.0	Based on APHA (2017), 4500-H (B)	Bangkok
Residual Free Chlorine *	mg/L	-	0.1	0.1	≤1.0	APHA (2017), 4500-Cl/F	Bangkok
Temperature *	Degree C	-	-	32.4	≤40	Based on APHA (2017), 2550 B	Bangkok
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1840	≤3000	Based on APHA (2017), 2540 C	Bangkok
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	<5	≤50	Based on APHA (2017), 2540 D	Bangkok

Guideline: Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and Effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07. B.E.2560 (2017).

Remarks :

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

Karl Auk.
Karl Auk
Senior Manager
7-204-6-5111

Approved by

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2268997
TESTING
No. 0009
Date Received : Jun 08, 2022
Date Reported : Jun 15, 2022
Report Number : 2345710-1

Page 1 of 1

Sample Number	Z268997-1									
Sample Date	Jun 08, 2022 10:50 AM									
Sample Description	Wastewater									
Location	siamnityrasa'sinsurvis (Retention Pond)									
Date Analysis Commenced	Jun 09, 2022									
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)									
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location			
Water Testing										
BOD (5 days at 20 degree C)	mg/L	-	2	<2	≤20	Based on APHA (2017), 5210 B	Bangkok			
COD	mg/L	1.5	5	33	≤120	Based on APHA (2017), 5220 D	Bangkok			
Oil & Grease	mg/L	-	3	3	≤5	Based on APHA (2017), 5520 B	Bangkok			
pH at 25 degree C	-	-	-	7.9	5.5-9.0	Based on APHA (2017), 4500-H (B)	Bangkok			
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	APHA (2017), 4500-Cl(F)	Bangkok			
Temperature *	Degree C	-	-	33.1	≤40	Based on APHA (2017), 2550 B	Bangkok			
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	1360	≤3000	Based on APHA (2017), 2540 C	Bangkok			
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	7	≤50	Based on APHA (2017), 2540 D	Bangkok			

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Jirarat Khawlae

Remarks :
- LOD : Limit of Detection
- <" : Lower than LOQ (Limit of Quantitation) / LOQ (Limit of Reporting)
- Analyte(s) included : Value not included in scope of Accreditation ISO/IEC 17025
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2268997
TESTING
No. 0009
Date Received : Jun 08, 2022
Date Reported : Jun 15, 2022
Report Number : 2345710-1

Page 1 of 1

Sample Number	Z268997-1									
Sample Date	Jun 08, 2022 10:50 AM									
Sample Description	Wastewater									
Location	siamnityrasa'sinsurvis (Retention Pond)									
Date Analysis Commenced	Jun 09, 2022									
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)									
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location			
Water Testing										
BOD (5 days at 20 degree C)	mg/L	-	2	<2	≤20	Based on APHA (2017), 5210 B	Bangkok			
COD	mg/L	1.5	5	33	≤120	Based on APHA (2017), 5220 D	Bangkok			
Oil & Grease	mg/L	-	3	3	≤5	Based on APHA (2017), 5520 B	Bangkok			
pH at 25 degree C	-	-	-	7.9	5.5-9.0	Based on APHA (2017), 4500-H (B)	Bangkok			
Residual Free Chlorine *	mg/L	-	0.1	<0.1	≤1.0	APHA (2017), 4500-Cl(F)	Bangkok			
Temperature *	Degree C	-	-	33.1	≤40	Based on APHA (2017), 2550 B	Bangkok			
Total Dissolved solids Dried at 180 degree C	mg/L	-	5	1360	≤3000	Based on APHA (2017), 2540 C	Bangkok			
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	7	≤50	Based on APHA (2017), 2540 D	Bangkok			

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Jirarat Khawlae

Remarks :
- LOD : Limit of Detection
- <" : Lower than LOQ (Limit of Quantitation) / LOQ (Limit of Reporting)
- Analyte(s) included : Value not included in scope of Accreditation ISO/IEC 17025
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2268997
Date Received : Jun 08, 2022
Date Reported : Jun 15, 2022
Report Number : 2345710-2

Page 1 of 1

Sample Number	2268997-1						
Sample Date	Jun 08, 2022 10:50 AM						
Sample Description	Wastewater						
Location	สวนนิเวศธรรมสถาน (Retention Pond)						
Date Analysis Commenced	Jun 09, 2022						
Condition of Sample	Contained in two BOD bottles, one amber glass bottle and three plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Dissolved Oxygen	mg/L	-	0.1	6.9	No Standard	Based on APHA (2017), 4500-O (C)	Bangkok
Flow rate	m ³ /hr	-	-	12	No Standard	Analyzed by Client	Bangkok

Guideline : Effluent standard for factories, industrial estate and industrial park set by Notification of the Ministry of Natural Resource and Environment and effluent standard for factories and industrial park set by Notification of The Ministry of Industry dated June 07, B.E.2560 (2017).

Sampled By : Jirarat Khawlae

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

Technical Management

Sriuluk P.
Supervisor

Approved by

Kanokorn Anuk
Senior Manager

www.alsglobal.com

2345710-2

Approved by

Sriuluk P.
Supervisor

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S. Reports, AL Co. Ltd (4 pages)

ภาคผนวก ค-4

ระดับเสียงในบรรยากาศ



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267011-1

Page 1 of 1

Sample Number : 2220532-1
Parameter : Noise (Leq 24 hrs.)
Location : อพาร์ตเมนต์ 104 ชั้น 10 (GPS 47P 0669080, 1545569)
Measurement Date : Mar 03 - Mar 04, 2022
Measurement by : Vanch Phantipit
Sound Level meter : Serial No. 658242

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	58.3	71.6	57.6
11:00 AM - 12:00 PM	58.1	69.4	57.3
12:00 PM - 01:00 PM	58.7	70.3	57.2
01:00 PM - 02:00 PM	59.1	73.6	57.8
02:00 PM - 03:00 PM	59.2	71.6	57.7
03:00 PM - 04:00 PM	60.0	72.6	58.6
04:00 PM - 05:00 PM	59.2	74.9	58.0
05:00 PM - 06:00 PM	62.5	80.4	58.2
06:00 PM - 07:00 PM	61.6	76.1	59.1
07:00 PM - 08:00 PM	59.4	68.5	58.6
08:00 PM - 09:00 PM	58.8	64.6	58.4
09:00 PM - 10:00 PM	59.1	63.0	58.6
10:00 PM - 11:00 PM	59.0	64.1	58.4
11:00 PM - 12:00 AM	58.8	67.9	58.2
12:00 AM - 01:00 AM	59.1	71.5	58.2
01:00 AM - 02:00 AM	58.8	71.7	58.1
02:00 AM - 03:00 AM	59.1	73.4	58.4
03:00 AM - 04:00 AM	58.8	67.9	58.1
04:00 AM - 05:00 AM	59.0	66.0	58.2
05:00 AM - 06:00 AM	59.6	73.6	58.2
06:00 AM - 07:00 AM	62.2	91.1	58.6
07:00 AM - 08:00 AM	58.5	64.4	57.9
08:00 AM - 09:00 AM	58.9	82.7	57.8
09:00 AM - 10:00 AM	62.4	78.7	57.7
Leq Average 24 hrs. (dB(A))	59.7		
Lmax (dB(A))	91.1		58.2
L90 (dB(A))			
Ldn (dB(A))	66.0		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ใช้นิยามมาตรฐานวิธีวัดและประเมินค่าเสียงตามข้อกำหนดของกรมควบคุมมลพิษ (พ.ศ. 2540) สำหรับอาคารอยู่อาศัยในชุมชน
2. ใช้มาตรฐานการประเมินค่าเสียงตามข้อกำหนดของกรมควบคุมมลพิษ (พ.ศ. 2540) สำหรับอาคารอยู่อาศัยในชุมชน

Technical Management

Sawanya C.

Sarinya Chalerthamrong

Scientist (A)

Approved by

Supt S.

Supot Salameh

Section Head

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S-Report_Air Noise (of 4 2540)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267012-1

Page 1 of 1

Sample Number : 2220532-2
Parameter : Noise (Leq 24 hrs.)
Location : อพาร์ตเมนต์ 104 ชั้น 10 (GPS 47P 0669080, 1545569)
Measurement Date : Mar 04 - Mar 05, 2022
Measurement by : Vanch Phantipit
Sound Level meter : Serial No. 658242

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	65.0	81.0	58.1
11:00 AM - 12:00 PM	68.1	91.6	57.9
12:00 PM - 01:00 PM	59.3	70.1	58.3
01:00 PM - 02:00 PM	68.7	85.9	59.5
02:00 PM - 03:00 PM	64.5	90.3	59.5
03:00 PM - 04:00 PM	60.9	75.2	60.0
04:00 PM - 05:00 PM	60.3	69.8	59.4
05:00 PM - 06:00 PM	60.1	78.0	58.4
06:00 PM - 07:00 PM	61.3	70.2	58.6
07:00 PM - 08:00 PM	59.2	70.0	58.4
08:00 PM - 09:00 PM	59.1	71.4	58.6
09:00 PM - 10:00 PM	59.1	65.4	58.6
10:00 PM - 11:00 PM	58.6	70.6	58.6
11:00 PM - 12:00 AM	58.2	62.0	58.2
12:00 AM - 01:00 AM	59.0	65.3	57.9
01:00 AM - 02:00 AM	58.5	74.6	57.9
02:00 AM - 03:00 AM	59.1	70.9	58.0
03:00 AM - 04:00 AM	59.2	70.8	58.4
04:00 AM - 05:00 AM	58.9	70.5	58.2
05:00 AM - 06:00 AM	59.7	73.2	57.9
06:00 AM - 07:00 AM	59.6	76.1	57.7
07:00 AM - 08:00 AM	58.8	82.9	58.4
08:00 AM - 09:00 AM	58.8	72.6	57.6
09:00 AM - 10:00 AM	58.8	82.2	57.7
Leq Average 24 hrs. (dB(A))	61.9		
Lmax (dB(A))	98.3		58.3
L90 (dB(A))			
Ldn (dB(A))	66.2		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. ใช้นิยามมาตรฐานวิธีวัดและประเมินค่าเสียงตามข้อกำหนดของกรมควบคุมมลพิษ (พ.ศ. 2540) สำหรับอาคารอยู่อาศัยในชุมชน
2. ใช้มาตรฐานการประเมินค่าเสียงตามข้อกำหนดของกรมควบคุมมลพิษ (พ.ศ. 2540) สำหรับอาคารอยู่อาศัยในชุมชน

Technical Management

Sawanya C.

Sarinya Chalerthamrong

Scientist (A)

Approved by

Supt S.

Supot Salameh

Section Head

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S-Report_Air Noise (of 4 2540)



Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267013-1

Page 1 of 1

Sample Number	2220532-3
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณทางเข้าด้านหน้าโรงงาน (GPS 47P 0669080, 1545569)
Measurement Date	Mar 05 - Mar 06, 2022
Measurement by	Vanch Phanpoot
Sound Level meter	Serial No. 658242

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	58.7	78.3	57.7
11:00 AM - 12:00 PM	58.5	73.3	57.6
12:00 PM - 01:00 PM	59.0	71.6	57.9
01:00 PM - 02:00 PM	59.5	72.0	58.3
02:00 PM - 03:00 PM	59.3	76.9	58.1
03:00 PM - 04:00 PM	59.6	73.6	58.2
04:00 PM - 05:00 PM	63.4	74.9	58.4
05:00 PM - 06:00 PM	60.2	78.3	58.1
06:00 PM - 07:00 PM	62.1	72.3	58.9
07:00 PM - 08:00 PM	59.4	71.4	58.4
08:00 PM - 09:00 PM	59.8	74.1	59.1
09:00 PM - 10:00 PM	59.0	68.5	58.4
10:00 PM - 11:00 PM	58.7	69.6	58.2
11:00 PM - 12:00 AM	58.4	65.7	57.9
12:00 AM - 01:00 AM	58.4	64.1	57.9
01:00 AM - 02:00 AM	58.8	72.7	58.1
02:00 AM - 03:00 AM	59.3	72.6	58.6
03:00 AM - 04:00 AM	59.3	69.4	58.8
04:00 AM - 05:00 AM	59.3	74.5	58.0
05:00 AM - 06:00 AM	59.9	77.4	57.9
06:00 AM - 07:00 AM	58.0	71.3	57.2
07:00 AM - 08:00 AM	58.2	72.2	57.2
08:00 AM - 09:00 AM	58.1	71.3	56.9
09:00 AM - 10:00 AM	60.4	79.8	58.8
Leq Average 24 hrs. (dB(A))	59.6		
Lmax (dB(A))	79.8		
L90 (dB(A))	58.1		
Ldn (dB(A))	65.5		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. มาตรฐานการวัดและประเมินค่าระดับเสียงตามอาคาร 15 (พ.ศ. 2540) (สำหรับการวัดและประเมินค่าระดับเสียงในอาคาร)
2. มาตรฐานการวัดและประเมินค่าระดับเสียงตามอาคาร 15 (พ.ศ. 2540) (สำหรับการวัดและประเมินค่าระดับเสียงในอาคาร)
โดย น.ร. 2548

Technical Management

Sawanya C.

Scientist (4)

Approved by

Supt S.

Supot Salameh
Section Head

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S/Reports_Air Noise (p1) (2024)



Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Muang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267014-1

Page 1 of 1

Sample Number	2220532-4
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณทางเข้าด้านหน้าโรงงาน (GPS 47P 0669080, 1545569)
Measurement Date	Mar 05 - Mar 07, 2022
Measurement by	Vanch Phanpoot
Sound Level meter	Serial No. 658242

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	59.7	71.9	58.6
11:00 AM - 12:00 PM	60.4	84.2	58.8
12:00 PM - 01:00 PM	58.8	70.6	58.1
01:00 PM - 02:00 PM	59.9	74.5	58.4
02:00 PM - 03:00 PM	61.5	74.0	59.4
03:00 PM - 04:00 PM	60.2	78.3	58.1
04:00 PM - 05:00 PM	62.1	72.3	58.9
05:00 PM - 06:00 PM	59.4	71.4	58.4
06:00 PM - 07:00 PM	58.8	72.6	57.6
07:00 PM - 08:00 PM	58.8	82.2	57.7
08:00 PM - 09:00 PM	58.7	78.3	57.7
09:00 PM - 10:00 PM	58.5	73.3	57.6
10:00 PM - 11:00 PM	59.0	71.6	57.9
11:00 PM - 12:00 AM	58.2	65.3	57.9
12:00 AM - 01:00 AM	59.0	74.6	57.9
01:00 AM - 02:00 AM	58.5	70.9	58.0
02:00 AM - 03:00 AM	59.1	70.8	58.4
03:00 AM - 04:00 AM	59.2	70.5	58.2
04:00 AM - 05:00 AM	59.1	73.6	57.8
05:00 AM - 06:00 AM	59.2	71.6	57.7
06:00 AM - 07:00 AM	60.0	72.6	58.6
07:00 AM - 08:00 AM	59.2	74.9	58.0
08:00 AM - 09:00 AM	62.5	90.4	58.2
09:00 AM - 10:00 AM	61.6	76.1	59.1
Leq Average 24 hrs. (dB(A))	59.8		
Lmax (dB(A))	90.4		
L90 (dB(A))	58.1		
Ldn (dB(A))	65.7		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. มาตรฐานการวัดและประเมินค่าระดับเสียงตามอาคาร 15 (พ.ศ. 2540) (สำหรับการวัดและประเมินค่าระดับเสียงในอาคาร)
2. มาตรฐานการวัดและประเมินค่าระดับเสียงตามอาคาร 15 (พ.ศ. 2540) (สำหรับการวัดและประเมินค่าระดับเสียงในอาคาร)
โดย น.ร. 2548

Technical Management

Sawanya C.

Scientist (4)

Approved by

Supt S.

Supot Salameh
Section Head

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S/Reports_Air Noise (p1) (2024)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267015-1

Page 1 of 1

Sample Number	2220532-5
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณหน้าโรงงาน (GPS 47P 0669080, 1545569)
Measurement Date	Mar 07 - Mar 08, 2022
Measurement by	Vanch Phangpoot
Sound Level meter	Serial No. 658242

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	59.1	71.5	58.2
11:00 AM - 12:00 PM	58.8	71.7	58.1
12:00 PM - 01:00 PM	59.1	71.4	58.4
01:00 PM - 02:00 PM	58.8	67.9	58.1
02:00 PM - 03:00 PM	59.0	66.0	58.2
03:00 PM - 04:00 PM	59.6	73.6	58.2
04:00 PM - 05:00 PM	68.7	85.9	59.5
05:00 PM - 06:00 PM	64.5	98.3	59.5
06:00 PM - 07:00 PM	60.9	75.2	60.0
07:00 PM - 08:00 PM	60.3	69.8	59.4
08:00 PM - 09:00 PM	60.1	78.0	58.4
09:00 PM - 10:00 PM	59.6	73.6	58.2
10:00 PM - 11:00 PM	63.4	74.9	58.4
11:00 PM - 12:00 AM	60.2	78.3	58.1
12:00 AM - 01:00 AM	62.1	72.3	58.9
01:00 AM - 02:00 AM	59.4	71.4	58.4
02:00 AM - 03:00 AM	59.8	74.1	59.1
03:00 AM - 04:00 AM	58.4	65.7	57.9
04:00 AM - 05:00 AM	58.4	64.1	57.9
05:00 AM - 06:00 AM	58.8	72.7	58.1
06:00 AM - 07:00 AM	59.3	72.6	58.6
07:00 AM - 08:00 AM	59.4	69.4	58.8
08:00 AM - 09:00 AM	59.0	66.0	58.2
09:00 AM - 10:00 AM	59.6	73.6	58.2

Leq Average 24 hrs. (dB(A))	61.2
Lmax (dB(A))	98.3
L90 (dB(A))	58.2
L01 (dB(A))	
Standard (dB(A))	70
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. หน่วยงานมาตรฐานอุตสาหกรรม (กรมอุตสาหกรรมพื้นฐานและการเหมืองแร่) ฉบับที่ 15 (พ.ศ. 2540) สำหรับโรงงานอุตสาหกรรม	
2. หน่วยงานมาตรฐาน (กรมอุตสาหกรรมพื้นฐานและการเหมืองแร่) ฉบับที่ 15 (พ.ศ. 2540) สำหรับโรงงานอุตสาหกรรม	
Tested on: 2548	

Technical Management : *Savanya C.*
Savanya Chaleramrong
Scientist (4)

Approved by : *Supt S.*
Supt Salameh
Section Head

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



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267016-1

Page 1 of 1

Sample Number	2220532-6
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณหน้าโรงงาน (GPS 47P 0669148, 1545385)
Measurement Date	Mar 03 - Mar 04, 2022
Measurement by	Vanch Phangpoot
Sound Level meter	Serial No. 584983

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	62.7	71.8	62.1
11:00 AM - 12:00 PM	62.7	70.3	62.3
12:00 PM - 01:00 PM	62.8	77.0	62.3
01:00 PM - 02:00 PM	63.2	78.6	62.2
02:00 PM - 03:00 PM	62.8	78.5	62.1
03:00 PM - 04:00 PM	64.4	86.3	62.4
04:00 PM - 05:00 PM	63.4	78.3	62.5
05:00 PM - 06:00 PM	63.0	77.7	62.4
06:00 PM - 07:00 PM	63.0	67.7	62.6
07:00 PM - 08:00 PM	63.0	70.2	62.6
08:00 PM - 09:00 PM	63.0	67.2	62.6
09:00 PM - 10:00 PM	63.1	66.1	62.7
10:00 PM - 11:00 PM	63.0	65.9	62.6
11:00 PM - 12:00 AM	63.0	67.0	62.6
12:00 AM - 01:00 AM	63.0	65.5	62.7
01:00 AM - 02:00 AM	63.0	64.4	62.6
02:00 AM - 03:00 AM	63.0	66.4	62.5
03:00 AM - 04:00 AM	62.9	65.1	62.5
04:00 AM - 05:00 AM	62.9	65.0	62.4
05:00 AM - 06:00 AM	63.3	79.8	62.2
06:00 AM - 07:00 AM	62.9	73.8	62.2
07:00 AM - 08:00 AM	63.0	80.1	62.2
08:00 AM - 09:00 AM	62.9	76.6	62.1
09:00 AM - 10:00 AM	62.9		

Leq Average 24 hrs. (dB(A))	63.1
Lmax (dB(A))	86.3
L90 (dB(A))	62.5
L01 (dB(A))	
Standard (dB(A))	115
Reference Method : ISO1996-1 and 1996-2	
Standard : 1. หน่วยงานมาตรฐานอุตสาหกรรม (กรมอุตสาหกรรมพื้นฐานและการเหมืองแร่) ฉบับที่ 15 (พ.ศ. 2540) สำหรับโรงงานอุตสาหกรรม	
2. หน่วยงานมาตรฐาน (กรมอุตสาหกรรมพื้นฐานและการเหมืองแร่) ฉบับที่ 15 (พ.ศ. 2540) สำหรับโรงงานอุตสาหกรรม	
Tested on: 2548	

Technical Management : *Savanya C.*
Savanya Chaleramrong
Scientist (4)

Approved by : *Supt S.*
Supt Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510485
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267017-1

Page 1 of 1

Sample Number	2220532-7
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่ก่อสร้าง (GPS 47P 0669148, 1545385)
Measurement Date	Mar 04 - Mar 05, 2022
Measurement by	Vanch Phansipit
Sound Level meter	Serial No. 584983

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	62.3	76.8	61.7
11:00 AM - 12:00 PM	62.2	70.3	61.7
12:00 PM - 01:00 PM	62.3	70.7	61.7
01:00 PM - 02:00 PM	62.8	72.4	62.1
02:00 PM - 03:00 PM	62.7	69.4	62.2
03:00 PM - 04:00 PM	62.9	76.5	62.4
04:00 PM - 05:00 PM	63.2	75.3	62.6
05:00 PM - 06:00 PM	63.0	76.9	62.4
06:00 PM - 07:00 PM	63.0	81.0	62.5
07:00 PM - 08:00 PM	63.1	65.0	62.7
08:00 PM - 09:00 PM	63.1	66.6	62.7
09:00 PM - 10:00 PM	63.0	66.5	62.6
10:00 PM - 11:00 PM	62.9	65.9	62.5
11:00 PM - 12:00 AM	63.0	65.6	62.6
12:00 AM - 01:00 AM	62.9	71.1	62.5
01:00 AM - 02:00 AM	62.8	65.1	62.4
02:00 AM - 03:00 AM	62.8	66.7	62.4
03:00 AM - 04:00 AM	63.0	64.5	62.4
04:00 AM - 05:00 AM	63.0	67.4	62.6
05:00 AM - 06:00 AM	63.0	66.0	62.5
06:00 AM - 07:00 AM	63.0	68.2	62.5
07:00 AM - 08:00 AM	63.6	81.5	62.5
08:00 AM - 09:00 AM	63.1	76.7	62.3
09:00 AM - 10:00 AM	62.7	73.6	62.1

Leq Average 24 hrs. (dB(A))	62.9
Lmax (dB(A))	81.5
L90 (dB(A))	62.4
L01 (dB(A))	
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับอาคารสูงที่มีพื้นที่ใช้สอยตั้งแต่ 150 ตารางเมตรขึ้นไป
2. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับอาคารสูงที่มีพื้นที่ใช้สอยตั้งแต่ 150 ตารางเมตรขึ้นไป

Tested on: Mar. 2548

Technical Management
Sawanya C.
Sawanya Chalermbharnong
Scientist (4)

Approved by

Supt S.
Supt Salameh
Section Head

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10099-31/ENAL

S:\Reports_Air Noise\p1 4 26748



Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510485
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267018-1

Page 1 of 1

Sample Number	2220532-8
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่ก่อสร้าง (GPS 47P 0669148, 1545385)
Measurement Date	Mar 05 - Mar 06, 2022
Measurement by	Vanch Phansipit
Sound Level meter	Serial No. 584983

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	62.6	76.5	62.0
11:00 AM - 12:00 PM	62.4	72.0	61.9
12:00 PM - 01:00 PM	62.4	73.3	61.9
01:00 PM - 02:00 PM	62.3	71.7	61.8
02:00 PM - 03:00 PM	62.4	73.3	61.9
03:00 PM - 04:00 PM	62.4	74.5	62.1
04:00 PM - 05:00 PM	62.6	70.8	62.2
05:00 PM - 06:00 PM	63.0	68.3	62.5
06:00 PM - 07:00 PM	63.2	74.3	62.6
07:00 PM - 08:00 PM	63.1	69.3	62.7
08:00 PM - 09:00 PM	63.2	70.3	62.7
09:00 PM - 10:00 PM	63.3	67.3	62.8
10:00 PM - 11:00 PM	63.1	69.2	62.4
11:00 PM - 12:00 AM	62.8	69.3	62.2
12:00 AM - 01:00 AM	62.8	69.1	62.2
01:00 AM - 02:00 AM	62.8	74.2	62.3
02:00 AM - 03:00 AM	62.7	67.7	62.2
03:00 AM - 04:00 AM	62.7	65.4	62.2
04:00 AM - 05:00 AM	62.9	66.2	62.4
05:00 AM - 06:00 AM	63.6	79.5	62.6
06:00 AM - 07:00 AM	63.3	85.8	62.3
07:00 AM - 08:00 AM	63.0	79.8	62.3
08:00 AM - 09:00 AM	63.6	82.5	62.4
09:00 AM - 10:00 AM	63.4	74.9	62.7

Leq Average 24 hrs. (dB(A))	62.9
Lmax (dB(A))	85.8
L90 (dB(A))	62.3
L01 (dB(A))	
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับอาคารสูงที่มีพื้นที่ใช้สอยตั้งแต่ 150 ตารางเมตรขึ้นไป
2. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับอาคารสูงที่มีพื้นที่ใช้สอยตั้งแต่ 150 ตารางเมตรขึ้นไป

Tested on: Mar. 2548

Technical Management
Sawanya C.
Sawanya Chalermbharnong
Scientist (4)

Approved by

Supt S.
Supt Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Banglad Industrial Park, Banglad Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267019-1

Page 1 of 8

Sample Number	2220532-9
Parameter	Noise (Leq 24 hrs.)
Location	ถนนวิภาวดีรังสิต/ถนน (GPS 47P 0659148, 1545385)
Measurement Date	Mar 06 - Mar 07, 2022
Measurement by	Varich Phunpitt
Sound Level meter	Serial No. 584983

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	63.2	66.4	62.6
11:00 AM - 12:00 PM	63.0	68.7	62.5
12:00 PM - 01:00 PM	63.0	68.8	62.4
01:00 PM - 02:00 PM	63.2	68.5	62.5
02:00 PM - 03:00 PM	63.2	67.3	62.6
03:00 PM - 04:00 PM	63.1	66.4	62.6
04:00 PM - 05:00 PM	63.2	74.9	62.7
05:00 PM - 06:00 PM	65.0	80.9	62.9
06:00 PM - 07:00 PM	64.3	82.4	63.0
07:00 PM - 08:00 PM	63.3	71.8	62.9
08:00 PM - 09:00 PM	63.4	66.2	63.0
09:00 PM - 10:00 PM	63.3	68.3	63.0
10:00 PM - 11:00 PM	63.8	66.6	63.5
11:00 PM - 12:00 AM	63.9	65.9	63.5
12:00 AM - 01:00 AM	64.0	65.7	63.6
01:00 AM - 02:00 AM	63.8	65.2	63.4
02:00 AM - 03:00 AM	63.8	65.0	63.4
03:00 AM - 04:00 AM	63.8	64.9	63.5
04:00 AM - 05:00 AM	64.2	83.5	63.5
05:00 AM - 06:00 AM	63.7	71.3	63.4
06:00 AM - 07:00 AM	63.7	70.3	63.4
07:00 AM - 08:00 AM	63.7	69.4	63.4
08:00 AM - 09:00 AM	63.6	69.6	63.1
09:00 AM - 10:00 AM	63.9	71.3	63.3

Leq Average 24 hrs. (dB(A))	63.7
Lmax (dB(A))	83.5
L90 (dB(A))	63.0
Ldn (dB(A))	70.2
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2
Standard : 1. หน่วยงานกรุงเทพมหานคร ฉบับที่ 15 (พ.ศ. 2540) (กรุงเทพมหานครฉบับที่ 15)
2. หน่วยงานกรุงเทพมหานคร ฉบับที่ 15 (พ.ศ. 2540) (กรุงเทพมหานครฉบับที่ 15)

Technical Management : *Sawanya C.*
Scientist (4)
Approved by : *Supt S.*
Supt. Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Banglad Industrial Park, Banglad Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267020-1

Page 1 of 1

Sample Number	2220532-10
Parameter	Noise (Leq 24 hrs.)
Location	ถนนวิภาวดีรังสิต/ถนน (GPS 47P 0659148, 1545385)
Measurement Date	Mar 07 - Mar 08, 2022
Measurement by	Varich Phunpitt
Sound Level meter	Serial No. 584983

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	63.5	75.2	62.8
11:00 AM - 12:00 PM	63.5	70.1	62.5
12:00 PM - 01:00 PM	62.9	67.6	62.5
01:00 PM - 02:00 PM	63.2	70.9	62.7
02:00 PM - 03:00 PM	63.4	75.9	62.8
03:00 PM - 04:00 PM	63.3	78.1	62.8
04:00 PM - 05:00 PM	63.4	71.4	62.7
05:00 PM - 06:00 PM	63.5	70.2	62.9
06:00 PM - 07:00 PM	63.6	78.1	62.9
07:00 PM - 08:00 PM	63.5	65.4	63.0
08:00 PM - 09:00 PM	63.7	65.7	63.2
09:00 PM - 10:00 PM	63.8	73.5	63.3
10:00 PM - 11:00 PM	63.9	66.5	63.3
11:00 PM - 12:00 AM	63.8	66.4	63.4
12:00 AM - 01:00 AM	63.8	68.4	63.4
01:00 AM - 02:00 AM	63.9	65.2	63.5
02:00 AM - 03:00 AM	64.0	65.4	63.5
03:00 AM - 04:00 AM	64.1	65.4	63.7
04:00 AM - 05:00 AM	64.5	69.0	63.7
05:00 AM - 06:00 AM	64.6	67.5	64.1
06:00 AM - 07:00 AM	64.5	67.4	64.0
07:00 AM - 08:00 AM	64.4	75.0	63.9
08:00 AM - 09:00 AM	64.3	68.5	63.8
09:00 AM - 10:00 AM	64.9	77.3	63.7

Leq Average 24 hrs. (dB(A))	63.8
Lmax (dB(A))	78.1
L90 (dB(A))	63.2
Ldn (dB(A))	70.4
Standard (dB(A))	70

Reference Method : ISO1996-1 and 1996-2
Standard : 1. หน่วยงานกรุงเทพมหานคร ฉบับที่ 15 (พ.ศ. 2540) (กรุงเทพมหานครฉบับที่ 15)
2. หน่วยงานกรุงเทพมหานคร ฉบับที่ 15 (พ.ศ. 2540) (กรุงเทพมหานครฉบับที่ 15)

Technical Management : *Sawanya C.*
Scientist (4)
Approved by : *Supt S.*
Supt. Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangladi Industrial Park, Bangladi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267021-1

Page 1 of 5

Sample Number	2220532-11
Parameter	Noise (Leq 24 hrs.)
Location	ถนนพหลโยธินกิโลเมตรที่ 15 (ก.ม. 2540) ด้านถนนทางหลวงชนบทสาย 101
Measurement Date	Mar 03 - Mar 04, 2022
Measurement by	Varich Phantipit
Sound Level meter	Serial No. 658240

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	52.4	83.7	50.1
11:00 AM - 12:00 PM	51.1	65.8	49.2
12:00 PM - 01:00 PM	51.7	74.4	49.7
01:00 PM - 02:00 PM	50.8	61.3	49.7
02:00 PM - 03:00 PM	50.8	65.0	49.0
03:00 PM - 04:00 PM	50.3	58.4	48.7
04:00 PM - 05:00 PM	51.1	66.4	49.2
05:00 PM - 06:00 PM	56.6	83.4	50.3
06:00 PM - 07:00 PM	52.3	65.9	51.4
07:00 PM - 08:00 PM	52.6	64.0	51.7
08:00 PM - 09:00 PM	52.5	65.3	51.6
09:00 PM - 10:00 PM	51.9	57.1	51.2
10:00 PM - 11:00 PM	51.3	56.6	50.7
11:00 PM - 12:00 AM	51.1	55.0	50.6
12:00 AM - 01:00 AM	51.0	54.8	50.4
01:00 AM - 02:00 AM	51.1	59.6	50.6
02:00 AM - 03:00 AM	50.9	66.8	50.2
03:00 AM - 04:00 AM	51.3	62.7	50.4
04:00 AM - 05:00 AM	51.3	56.2	50.5
05:00 AM - 06:00 AM	51.7	61.1	50.7
06:00 AM - 07:00 AM	53.4	68.0	52.0
07:00 AM - 08:00 AM	53.9	74.3	51.6
08:00 AM - 09:00 AM	52.4	73.9	50.4
09:00 AM - 10:00 AM	51.2	72.0	50.0

Leq Average 24 hrs. (dB(A))	52.1
Lmax (dB(A))	83.7
L90 (dB(A))	50.4
Ldn (dB(A))	58.1

Standard (dB(A)) 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. หน่วยงานมาตรฐานสิ่งแวดล้อมของประเทศไทย (พ.ร.บ. 2540) ด้านถนนทางหลวงชนบทสาย 101
2. หน่วยงานมาตรฐานสิ่งแวดล้อมของกรุงเทพมหานคร (พ.ร.บ. 2540) ด้านถนนทางหลวงชนบทสาย 101
Note : This Analysis test report is issued to supersede report No. 2263805-1 Date Reported : Mar 17, 2022 due to revise analytical information

Technical Management

Saranya Chalerthanrong

Scientist (4)

Approved by

Supt S.

Supt Salameh
Section Head

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5 Upports_Air Noise (v) (4.3394)



Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangladi Industrial Park, Bangladi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267022-1

Page 1 of 1

Sample Number	2220532-12
Parameter	Noise (Leq 24 hrs.)
Location	ถนนพหลโยธินกิโลเมตรที่ 15 (ก.ม. 2540) ด้านถนนทางหลวงชนบทสาย 101
Measurement Date	Mar 04 - Mar 05, 2022
Measurement by	Varich Phantipit
Sound Level meter	Serial No. 658240

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	51.2	72.9	49.8
11:00 AM - 12:00 PM	50.8	68.6	48.6
12:00 PM - 01:00 PM	51.3	67.5	49.6
01:00 PM - 02:00 PM	51.5	60.8	50.0
02:00 PM - 03:00 PM	51.7	67.2	50.3
03:00 PM - 04:00 PM	52.3	69.8	51.0
04:00 PM - 05:00 PM	51.3	67.1	49.6
05:00 PM - 06:00 PM	53.6	76.3	49.6
06:00 PM - 07:00 PM	51.5	63.0	50.6
07:00 PM - 08:00 PM	52.6	64.2	51.2
08:00 PM - 09:00 PM	51.7	63.6	51.0
09:00 PM - 10:00 PM	51.7	64.5	51.0
10:00 PM - 11:00 PM	52.0	57.6	51.4
11:00 PM - 12:00 AM	51.8	57.5	51.4
12:00 AM - 01:00 AM	51.7	58.6	51.0
01:00 AM - 02:00 AM	51.4	57.2	50.8
02:00 AM - 03:00 AM	51.9	60.0	50.7
03:00 AM - 04:00 AM	52.4	63.8	51.2
04:00 AM - 05:00 AM	52.8	61.2	51.6
05:00 AM - 06:00 AM	52.9	63.2	51.5
06:00 AM - 07:00 AM	53.6	72.4	52.1
07:00 AM - 08:00 AM	53.2	67.5	51.8
08:00 AM - 09:00 AM	52.0	68.0	50.8
09:00 AM - 10:00 AM	51.4	65.7	49.4

Leq Average 24 hrs. (dB(A))	52.1
Lmax (dB(A))	76.3
L90 (dB(A))	50.8
Ldn (dB(A))	58.7

Standard (dB(A)) 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. หน่วยงานมาตรฐานสิ่งแวดล้อมของประเทศไทย (พ.ร.บ. 2540) ด้านถนนทางหลวงชนบทสาย 101
2. หน่วยงานมาตรฐานสิ่งแวดล้อมของกรุงเทพมหานคร (พ.ร.บ. 2540) ด้านถนนทางหลวงชนบทสาย 101
Note : This Analysis test report is issued to supersede report No. 2263806-1 Date Reported : Mar 17, 2022 due to revise analytical information

Technical Management

Saranya Chalerthanrong

Scientist (4)

Approved by

Supt S.

Supt Salameh
Section Head

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10869-31/ENGL

5 Upports_Air Noise (v) (4.3394)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267023-1

Page 1 of 1

Sample Number : 2220532-13
Parameter : Noise (Leq 24 hrs.)
Location : ฐานเสียง/เสียงรบกวน/เสียง (GPS 47P 0668770, 1545639)
Measurement Date : Mar 05 - Mar 06, 2022
Measurement by : Vanch Phanopit
Sound Level meter : Serial No. 658240

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	51.7	62.6	49.8
11:00 AM - 12:00 PM	51.5	62.6	49.6
12:00 PM - 01:00 PM	58.1	65.2	50.1
01:00 PM - 02:00 PM	56.7	64.5	50.6
02:00 PM - 03:00 PM	58.3	68.5	50.1
03:00 PM - 04:00 PM	50.5	63.0	49.0
04:00 PM - 05:00 PM	51.2	63.2	49.4
05:00 PM - 06:00 PM	52.0	68.0	50.6
06:00 PM - 07:00 PM	52.0	65.0	50.6
07:00 PM - 08:00 PM	52.1	61.6	51.2
08:00 PM - 09:00 PM	52.5	64.6	51.7
09:00 PM - 10:00 PM	52.6	66.2	51.8
10:00 PM - 11:00 PM	52.6	60.9	51.6
11:00 PM - 12:00 AM	52.7	67.4	51.8
12:00 AM - 01:00 AM	52.6	58.2	51.2
01:00 AM - 02:00 AM	52.6	59.1	51.7
02:00 AM - 03:00 AM	52.6	58.4	51.9
03:00 AM - 04:00 AM	51.6	55.6	50.8
04:00 AM - 05:00 AM	51.6	60.5	50.6
05:00 AM - 06:00 AM	52.1	65.3	50.7
06:00 AM - 07:00 AM	53.2	70.0	51.5
07:00 AM - 08:00 AM	53.1	60.7	51.4
08:00 AM - 09:00 AM	51.6	61.8	50.4
09:00 AM - 10:00 AM	51.7	67.6	49.5

Leq Average 24 hrs. (dB(A)) : 53.4
Lmax (dB(A)) : 88.5
L90 (dB(A)) : 50.6
Ldn (dB(A)) : 59.0

Standard (dB(A)) : 70
Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับเสียงรบกวนในชุมชน
2. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับเสียงรบกวนในชุมชน

Note : This Analysis test report is issued to supersede report No. 2263807-1 Date Reported : Mar 17, 2022 due to revise analytical information

Technical Management : Sawanya C.
Scientist (S)
Approved by : Supt S.
Supt Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267024-1

Page 1 of 1

Sample Number : 2220532-14
Parameter : Noise (Leq 24 hrs.)
Location : ฐานเสียง/เสียงรบกวน/เสียง (GPS 47P 0668770, 1545639)
Measurement Date : Mar 06 - Mar 07, 2022
Measurement by : Vanch Phanopit
Sound Level meter : Serial No. 658240

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:00 AM - 11:00 AM	50.9	64.1	49.0
11:00 AM - 12:00 PM	50.4	67.4	48.5
12:00 PM - 01:00 PM	49.8	67.5	48.3
01:00 PM - 02:00 PM	50.3	69.0	48.6
02:00 PM - 03:00 PM	50.1	67.6	48.1
03:00 PM - 04:00 PM	50.6	67.2	49.0
04:00 PM - 05:00 PM	51.4	72.1	49.4
05:00 PM - 06:00 PM	51.1	66.5	49.6
06:00 PM - 07:00 PM	51.7	66.5	50.2
07:00 PM - 08:00 PM	52.1	60.9	51.2
08:00 PM - 09:00 PM	51.6	58.9	51.2
09:00 PM - 10:00 PM	51.6	56.2	50.9
10:00 PM - 11:00 PM	50.8	54.5	50.0
11:00 PM - 12:00 AM	50.3	55.4	49.7
12:00 AM - 01:00 AM	50.6	60.3	49.8
01:00 AM - 02:00 AM	50.1	56.3	49.3
02:00 AM - 03:00 AM	49.3	54.1	48.6
03:00 AM - 04:00 AM	49.8	54.3	49.1
04:00 AM - 05:00 AM	49.7	54.7	49.0
05:00 AM - 06:00 AM	51.1	65.4	49.6
06:00 AM - 07:00 AM	52.8	65.7	51.4
07:00 AM - 08:00 AM	53.0	63.9	51.4
08:00 AM - 09:00 AM	51.9	65.6	50.5
09:00 AM - 10:00 AM	51.9	66.8	50.4

Leq Average 24 hrs. (dB(A)) : 51.1
Lmax (dB(A)) : 72.1
L90 (dB(A)) : 49.6
Ldn (dB(A)) : 57.1

Standard (dB(A)) : 115
Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับเสียงรบกวนในชุมชน
2. กรุงเทพมหานครและปริมณฑล ฉบับที่ 15 (พ.ศ. 2540) สำหรับเสียงรบกวนในชุมชน

Note : This Analysis test report is issued to supersede report No. 2263808-1 Date Reported : Mar 17, 2022 due to revise analytical information

Technical Management : Sawanya C.
Scientist (S)
Approved by : Supt S.
Supt Salameh
Section Head

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Analysis / Test Report

Client : B. Grimm BTP Power 1 Limited
202, Bangkadi Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220532
Date Received : Mar 09, 2022
Date Reported : Mar 21, 2022
Report Number: 2267025-1

Page 1 of 1

Sample Number : 2220532-15
Parameter : Noise (Leq 24 hrs.)
Location : กรุงเทพมหานคร (GPS 47P 0668770, 1545639)
Measurement Date : Mar 07 - Mar 08, 2022
Measurement by : Vanich Phanpitt
Sound Level meter : Serial No. 658240

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 11:00 AM	51.7	66.4	50.1
11:00 AM - 12:00 PM	50.5	68.6	49.0
12:00 PM - 01:00 PM	51.0	67.3	49.0
01:00 PM - 02:00 PM	51.1	62.6	49.3
02:00 PM - 03:00 PM	50.8	69.0	48.7
03:00 PM - 04:00 PM	50.7	68.3	48.6
04:00 PM - 05:00 PM	50.2	62.0	48.7
05:00 PM - 06:00 PM	51.0	71.1	49.3
06:00 PM - 07:00 PM	51.2	59.9	50.0
07:00 PM - 08:00 PM	51.3	65.7	50.6
08:00 PM - 09:00 PM	51.7	72.1	50.5
09:00 PM - 10:00 PM	58.6	84.0	53.2
10:00 PM - 11:00 PM	52.6	58.3	51.5
11:00 PM - 12:00 AM	52.2	60.1	51.4
12:00 AM - 01:00 AM	52.2	55.1	51.6
01:00 AM - 02:00 AM	51.8	67.5	51.0
02:00 AM - 03:00 AM	51.0	54.4	50.4
03:00 AM - 04:00 AM	50.3	58.8	49.3
04:00 AM - 05:00 AM	50.5	57.2	49.7
05:00 AM - 06:00 AM	51.2	63.8	50.1
06:00 AM - 07:00 AM	52.4	69.7	50.7
07:00 AM - 08:00 AM	53.1	69.3	51.0
08:00 AM - 09:00 AM	51.5	69.2	50.0
09:00 AM - 10:00 AM	52.2	73.5	50.2

Leq Average 24 hrs. (dB(A)) : 52.2
Lmax (dB(A)) : 84.0
L90 (dB(A)) : 50.1
Ldn (dB(A)) : 58.2
Standard (dB(A)) : 70

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรุงเทพมหานครฉบับที่ 15 (พ.ศ. 2546) ด้านการควบคุมเสียงรบกวนในชุมชน
2. กรุงเทพมหานครฉบับที่ 15 (พ.ศ. 2546) ด้านการควบคุมเสียงรบกวนในชุมชน
Version 1.0.2548

Note : This Analysis test report is issued to supersede report No. 2263809-1 Date Reported : Mar 17, 2022 due to revise analytical information

Technical Management :  Supat Chienhamrong
Scientist (4)
Approved by :  Supat Salamah
Section Head

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ภาคผนวก ค-5

ระดับเสียงในสถานประกอบการ



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220544
Date Received : Mar 04, 2022
Date Reported : Mar 09, 2022
Report Number: 2255200-1

Page 1 of 1

Sample Number	2220544-1
Parameter	Noise (Leq 8 hrs.)
Location	Gas Turbine Generator #11
Measurement Date	Mar 02, 2022
Measurement by	Thanit Janyip

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:40 AM - 11:40 AM	81.0	88.4	80.8
11:40 AM - 12:40 PM	81.0	81.5	80.8
12:40 PM - 01:40 PM	81.0	81.5	80.9
01:40 PM - 02:40 PM	81.0	81.5	80.9
02:40 PM - 03:40 PM	81.4	93.5	81.1
03:40 PM - 04:40 PM	81.4	81.9	81.2
04:40 PM - 05:40 PM	81.4	81.8	81.3
05:40 PM - 06:40 PM	81.3	81.8	81.2

Leq Average 8 hrs. (dB(A)) 81.2
Lmax (dB(A)) 93.5
Standard (dB(A)) 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : กรมส่งเสริมการค้าระหว่างประเทศ (สำหรับโรงงานอุตสาหกรรม)
Turn down noise level of the factory (สำหรับโรงงานอุตสาหกรรม) 70.0 dBA

Technical Management

Approved by

Supt S.

Supot Salameeh
Section Head

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10069 31/ ENR

S. Vajrapati, Air Noise ref (12 01PM)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2220544
Date Received : Mar 04, 2022
Date Reported : Mar 09, 2022
Report Number: 2255201-1

Page 1 of 1

Sample Number	2220544-2
Parameter	Noise (Leq 8 hrs.)
Location	Gas Turbine Generator #12
Measurement Date	Mar 02, 2022
Measurement by	Thanit Janyip

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:42 AM - 11:42 AM	80.5	82.3	80.3
11:42 AM - 12:42 PM	80.4	81.4	80.3
12:42 PM - 01:42 PM	80.4	81.2	80.2
01:42 PM - 02:42 PM	80.5	95.2	80.1
02:42 PM - 03:42 PM	80.6	81.3	80.4
03:42 PM - 04:42 PM	80.8	81.3	80.6
04:42 PM - 05:42 PM	80.6	81.3	80.5
05:42 PM - 06:42 PM	80.8	81.3	80.6

Leq Average 8 hrs. (dB(A)) 80.6
Lmax (dB(A)) 95.2
Standard (dB(A)) 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : กรมส่งเสริมการค้าระหว่างประเทศ (สำหรับโรงงานอุตสาหกรรม)
Turn down noise level of the factory (สำหรับโรงงานอุตสาหกรรม) 70.0 dBA

Technical Management

Approved by

Supt S.

Supot Salameeh
Section Head

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10069 31/ ENR

S. Vajrapati, Air Noise ref (12 01PM)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Banglad Industrial Park, Banglad Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220544

Date Received : Mar 04, 2022
Date Reported : Mar 09, 2022
Report Number: 2255202-1

Page 1 of 1

Sample Number	2220544-3
Parameter	Noise (Leq 8 hrs.)
Location	Air Compressor
Measurement Date	Mar 02, 2022
Measurement by	Thanit Jantip

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:20 AM - 11:20 AM	76.3	77.8	75.8
11:20 AM - 12:20 PM	76.4	79.0	75.7
12:20 PM - 01:20 PM	75.6	77.8	74.1
01:20 PM - 02:20 PM	76.1	93.6	74.7
02:20 PM - 03:20 PM	76.6	79.5	76.1
03:20 PM - 04:20 PM	76.5	77.9	76.0
04:20 PM - 05:20 PM	76.5	79.1	76.1
05:20 PM - 06:20 PM	76.6	79.5	76.1

Leq Average 8 hrs. (dB(A))	76.3
Lmax (dB(A))	93.6
Standard (dB(A))	140

Reference Method : Based on ISO1996-1 and 1996-2
Standard : จีเอ็มบีพีเพอร์ จำกัด (มหาชน) (B. Grimm BIP Power Co., Ltd.)
Turntable and its components are used in the test.

Technical Management

[Signature]
Sarnet Mongkornjiratt
Scientist (4)

Approved by

[Signature]
Supt S.

Supt Salmeh
Section Head

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10069-3/J/ENAL

S-Vipassit_Air Noise test (12-01546)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Banglad Industrial Park, Banglad Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2220544

Date Received : Mar 04, 2022
Date Reported : Mar 09, 2022
Report Number: 2255203-1

Page 1 of 1

Sample Number	2220544-4
Parameter	Noise (Leq 8 hrs.)
Location	Steam Turbine Generator #10
Measurement Date	Mar 02, 2022
Measurement by	Thanit Jantip

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:54 AM - 11:54 AM	71.7	72.9	71.4
11:54 AM - 12:54 PM	71.6	72.7	71.4
12:54 PM - 01:54 PM	71.8	84.3	71.4
01:54 PM - 02:54 PM	72.0	92.5	71.5
02:54 PM - 03:54 PM	78.0	87.0	71.6
03:54 PM - 04:54 PM	71.8	73.0	71.6
04:54 PM - 05:54 PM	71.8	72.9	71.6
05:54 PM - 06:54 PM	71.9	73.0	71.7

Leq Average 8 hrs. (dB(A))	73.3
Lmax (dB(A))	92.5
Standard (dB(A))	140

Reference Method : Based on ISO1996-1 and 1996-2
Standard : จีเอ็มบีพีเพอร์ จำกัด (มหาชน) (B. Grimm BIP Power Co., Ltd.)
Turntable and its components are used in the test.

Technical Management

[Signature]
Sarnet Mongkornjiratt
Scientist (4)

Approved by

[Signature]
Supt S.

Supt Salmeh
Section Head

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S-Vipassit_Air Noise test (12-00746)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2253930
Date Received : May 07, 2022
Date Reported : May 13, 2022
Report Number: 2312710-1

Page 1 of 1


Sample Number : 2253930-1
Parameter : Noise (Leq 8 hrs.)
Location : Gas Turbine Generator #11
Measurement Date : May 06, 2022
Measurement by : Phongiri Somkiew

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:12 AM - 11:12 AM	80.1	80.6	80.0
11:12 AM - 12:12 PM	80.1	81.4	80.0
12:12 PM - 01:12 PM	80.0	80.6	80.0
01:12 PM - 02:12 PM	80.0	80.5	79.9
02:12 PM - 03:12 PM	80.0	80.5	80.0
03:12 PM - 04:12 PM	80.1	80.5	80.0
04:12 PM - 05:12 PM	80.1	80.8	80.0
05:12 PM - 06:12 PM	80.4	81.1	80.2

Leq Average 8 hrs. (dB(A)) : 80.1
Lmax (dB(A)) : 81.4
Standard (dB(A)) : 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : มาตรฐานการกำหนดค่าระดับเสียงจากเครื่องจักรกลไฟฟ้า
Turbinแก๊สในโรงงานอุตสาหกรรม

Technical Management : 
Sarat Hongkijravit
Supervisor

Approved by

Section Head : 
Supot Salameh
Section Head

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S. Vajrapoti, Air Name ref (2 01P4)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :

Lot ID: 2253930
Date Received : May 07, 2022
Date Reported : May 13, 2022
Report Number: 2312711-1

Page 1 of 1

Sample Number : 2253930-2
Parameter : Noise (Leq 8 hrs.)
Location : Gas Turbine Generator #12
Measurement Date : May 06, 2022
Measurement by : Phongiri Somkiew

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:10 AM - 11:10 AM	79.9	80.8	79.7
11:10 AM - 12:10 PM	79.8	80.8	79.7
12:10 PM - 01:10 PM	79.8	80.5	79.6
01:10 PM - 02:10 PM	79.8	80.6	79.6
02:10 PM - 03:10 PM	79.8	86.3	79.6
03:10 PM - 04:10 PM	79.9	80.6	79.7
04:10 PM - 05:10 PM	79.9	80.7	79.7
05:10 PM - 06:10 PM	80.5	83.6	80.2

Leq Average 8 hrs. (dB(A)) : 79.9
Lmax (dB(A)) : 86.3
Standard (dB(A)) : 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : มาตรฐานการกำหนดค่าระดับเสียงจากเครื่องจักรกลไฟฟ้า
Turbinแก๊สในโรงงานอุตสาหกรรม

Technical Management : 
Sarat Hongkijravit
Supervisor

Approved by

Section Head : 
Supot Salameh
Section Head

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10069-31/THAIL

S. Vajrapoti, Air Name ref (2 02P4)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2253930
Date Received : May 07, 2022
Date Reported : May 13, 2022
Report Number: 2312712-1

Page 1 of 1

Sample Number : 2253930-3
Parameter : Noise (Leq 8 hrs.)
Location : Air Compressor
Measurement Date : May 06, 2022
Measurement by : Phongsiri Somkaew

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:02 AM - 11:02 AM	77.3	79.8	76.6
11:02 AM - 12:02 PM	77.3	79.4	76.5
12:02 PM - 01:02 PM	76.6	80.1	76.0
01:02 PM - 02:02 PM	76.6	79.3	76.1
02:02 PM - 03:02 PM	76.7	80.9	76.2
03:02 PM - 04:02 PM	76.6	82.3	76.1
04:02 PM - 05:02 PM	77.1	101.2	76.3
05:02 PM - 06:02 PM	80.7	109.9	75.6

Leq Average 8 hrs. (dB(A)) : 77.6
Lmax (dB(A)) : 109.9
Standard (dB(A)) : 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : กรมควบคุมมลพิษ (ฉบับแก้ไขเพิ่มเติม) พ.ศ. 2561
Standard : กรมควบคุมมลพิษ (ฉบับแก้ไขเพิ่มเติม) พ.ศ. 2561

Technical Management : 
Supervisor : Sarawat Mongkornjirawat

Approved by


Supot Salameh
Section Head

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10090 311 (ENL)

S/Report_Air Noise.pdf (2/25/24)



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkok Industrial Park, Bangkok Sub-district, Mueang Pathum Thani District,
Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2253930
Date Received : May 07, 2022
Date Reported : May 13, 2022
Report Number: 2312713-1

Page 1 of 1

Sample Number : 2253930-4
Parameter : Noise (Leq 8 hrs.)
Location : Steam Turbine Generator # 10
Measurement Date : May 06, 2022
Measurement by : Phongsiri Somkaew

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
10:16 AM - 11:16 AM	72.5	74.6	72.3
11:16 AM - 12:16 PM	72.6	73.5	72.3
12:16 PM - 01:16 PM	72.5	74.2	72.3
01:16 PM - 02:16 PM	72.5	73.5	72.3
02:16 PM - 03:16 PM	72.7	77.0	72.4
03:16 PM - 04:16 PM	72.8	75.5	72.5
04:16 PM - 05:16 PM	72.8	76.3	72.5
05:16 PM - 06:16 PM	73.8	80.4	73.0

Leq Average 8 hrs. (dB(A)) : 72.8
Lmax (dB(A)) : 80.4
Standard (dB(A)) : 90
Reference Method : Based on ISO1996-1 and 1996-2
Standard : กรมควบคุมมลพิษ (ฉบับแก้ไขเพิ่มเติม) พ.ศ. 2561
Standard : กรมควบคุมมลพิษ (ฉบับแก้ไขเพิ่มเติม) พ.ศ. 2561

Technical Management : 
Supervisor : Sarawat Mongkornjirawat

Approved by


Supot Salameh
Section Head

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S/Report_Air Noise.pdf (2/25/24)

ภาคผนวก ค-6

ระดับความร้อนในสถานประกอบการ



Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District, Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2241906
Date Received : Apr 08, 2022
Date Reported : Apr 12, 2022
Report Number: 2278005-1

Page 1 of 2

Sample Number	2241906-1					
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)					
Measurement Date	Apr 07, 2022					
Measurement by	Phongiri Sombhaew					
Location	บริเวณ 1 หลัง (ด้านหลังอาคาร : - มุม : -)					
Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)	
พื้นที่วัดค่า	120	27.8	24.9	35.5	33.0	
Average (WBGT)	27.8					
Guideline WBGT (°C)	34.0					

Reference Method : Wet Bulb Globe Temperature

Guideline:

- 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)
- Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment relation to Heat, Light and Noise, B.E.2559

Technical Management

Supt S.

Supot Salameh
Section Head

Approved by

Wichan Chonharat

Wichan Chonharat
Assistant Manager

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Analysis / Test Report

Client : B. Grimm BIP Power 1 Limited
202, Bangkadi Industrial Park, Bangkadi Sub-district, Mueang Pathum Thani District, Pathumthani Thailand 12000
P/O : 211510489
Project Name : BIP1
Project Location :
Lot ID: 2241906
Date Received : Apr 08, 2022
Date Reported : Apr 12, 2022
Report Number: 2278005-1

Page 2 of 2

Sample Number	2241906-2				
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)				
Measurement Date	Apr 07, 2022				
Measurement by	Phongiri Sombhaew				
Location	บริเวณ 1 หลัง (ด้านหลังห้องเก็บของ : - มุม : -)				
Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
พื้นที่วัดค่า	120	27.6	25.1	33.7	33.0
Average (WBGT)	27.6				
Guideline WBGT (°C)	34.0				

Reference Method : Wet Bulb Globe Temperature

Guideline:

- 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)
- Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment relation to Heat, Light and Noise, B.E.2559

Technical Management

Supt S.

Supot Salameh
Section Head

Approved by

Wichan Chonharat

Wichan Chonharat
Assistant Manager

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ						
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Oxides of Nitrogen	Console Control Unit	BK_F50448	6-Jan-22	6-Jul-22	6
Stack	Oxides of Nitrogen	Vacuum Gauge	BK_F50565	23-Dec-20	23-Jun-22	18
Stack	Oxides of Nitrogen	Spectrophotometer	BK_F60008	15-Oct-21	15-Oct-22	12
Stack	Sulfur Dioxide	Console Control Unit	BK_F50448	6-Jan-22	6-Jul-22	6
Stack	Sulfur Dioxide	Dry Gas	BK_F50494	10-Jan-22	10-Jul-22	6
Stack	Total Suspended Particulate	Console Control Unit	BK_F50448	6-Jan-22	6-Jul-22	6
Stack	Total Suspended Particulate	Digital Balance	BK_F60009	16-Dec-21	16-Dec-22	12
Stack	Carbon Monoxide	Console Control Unit	BK_F50448	6-Jan-22	6-Jul-22	6
Stack	Carbon Monoxide	CO Analyzer	BK_F60073	14-Oct-21	14-Apr-23	18
Ambient	Nitrogen Dioxide	NO2 Analyzer	BK_F50761	6-Jan-22	6-Jul-22	6
Ambient	Nitrogen Dioxide	NO2 Analyzer	BK_F50988	6-Jan-22	6-Jul-22	6
Ambient	Nitrogen Dioxide	NO2 Analyzer	BK_F50728	6-Jan-22	6-Jul-22	6
Ambient	Total Suspended Particulate	High Volume	BK_F50359	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BK_F50367	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BK_F50368	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BK_F60004	25-Feb-22	25-Feb-23	12
Ambient	Particulate Matter (PM-10)	High Volume	BK_F50388	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BK_F50375	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BK_F50562	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BK_F60004	25-Feb-22	25-Feb-23	12
Ambient	Sulfur Dioxide	SO2 Analyzer	BK_F50740	4-Jan-22	4-Jul-22	6
Ambient	Sulfur Dioxide	SO2 Analyzer	BK_F51067	4-Jan-22	4-Jul-22	6
Ambient	Sulfur Dioxide	SO2 Analyzer	BK_F50727	4-Jan-22	4-Jul-22	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BK_F50917	1-Nov-21	2-May-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BK_F50920	8-Oct-21	8-Apr-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BK_F50918	30-Aug-21	28-Feb-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	HYG_F50435	9-Dec-20	9-Jun-22	18
Water Lab	pH at 25 °C	pH meter	BK_F60072	26-Mar-21	26-Sep-22	18
Water Lab	BOD (5 days at 20°C)	DO Meter	BK_F60025	19-Jan-21	25-Jul-22	18
Water Lab	BOD (5 days at 20°C)	Incubator	BK_F60005	4-Oct-21	4-Apr-23	18
Water Lab	COO	Hot Block	BK_F60222	7-Apr-21	7-Apr-22	12
Water Lab	COO	Hot Block	BK_F60222	21-Mar-22	21-Mar-23	12
Water Lab	COO	Spectrophotometer	BK_F60018	15-Oct-21	15-Oct-22	12
Water Lab	Dissolved Oxygen	Burette	BK_F60171	30-Mar-21	28-Sep-22	18
Water Lab	Dissolved Oxygen	Chamber (Cold Room)	BK_F60167	18-May-21	16-Nov-22	18
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BK_F60003	3-Sep-21	3-Sep-22	12
Water Lab	Total Suspended Solids	Oven	BK_F60007	1-Dec-21	1-Jan-23	18

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ						
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BK_F60003	3-Sep-21	3-Sep-22	12
Water Lab	Total Dissolved Solids 180°C	Oven	BK_F60007	1-Dec-21	1-Jan-23	18
Water Lab	Oil & Grease (Soxhlet)	Electronic Top-Loading Balance	BK_F60003	3-Sep-21	3-Sep-22	12
Water Lab	Oil & Grease (Soxhlet)	Water Bath	BK_F60148	31-Jan-22	3-Aug-23	18
Water Lab	Residual Free Chlorine	Chlorine Meter	BK_F60018	20-Sep-21	20-Sep-22	12
Noise	Leq 24 hrs	Sound Calibrator	BK_F50633	14-Jan-22	14-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	BK_F50099	9-Jun-21	9-Jun-22	12
Noise	Leq 24 hrs	Sound Level Meter	BK_F50926	7-Jul-21	7-Jul-22	12
Noise	Leq 24 hrs	Sound Level Meter	BK_F50097	9-Nov-21	9-Nov-22	12
Noise	Leq 8 hrs	Sound Calibrator	BK_F50632	14-Jan-22	14-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50096	9-Nov-21	9-Nov-22	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50875	2-Nov-21	2-Nov-22	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50877	12-Oct-21	12-Oct-22	12
Noise	Leq 8 hrs	Sound Calibrator	BK_F50633	14-Jan-22	14-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50926	12-Oct-21	12-Oct-22	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50100	9-Jun-21	9-Jun-22	12
Noise	Leq 8 hrs	Sound Level Meter	BK_F50097	9-Nov-21	9-Nov-22	12
Heat	Heat Stress	Heat Stress Monitor	BK_F50642	14-Feb-22	14-Feb-23	12
Heat	Heat Stress	Heat Stress Monitor	BK_F50676	2-Nov-21	2-Nov-22	12

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CONSOLE CONTROL UNIT CALIBRATION TEST REPORT



Barometric Pressure (mmHg): 759
Relative Humidity (%): 68.0
Temperature: 32.0
Reference Dry Gas Meter Data
Serial No.: BK_F51122
Correction Factor (Y): A000240
Next Calibration Date: 1 Mar 22
Calibration No.: C-000122-BK_F50448
Dry Gas Meter No.: BK_F50448
Serial No.: 1901983
Model No.: XC-572-V

Reference Dry Gas Meter Calibration		Console Control Dry Gas Meter		Dry Gas Meter Calibration		Orifice Calibration	
Run No.	Time (min)	Flow (L/min)	Temp (°C)	Flow (L/min)	Temp (°C)	Factor	Factor
1	12.45	115000.0	32.0	115000.0	32.0	0.9758	0.9758
2	12.45	115000.0	32.0	115000.0	32.0	0.9717	0.9717
3	12.45	115000.0	32.0	115000.0	32.0	0.9694	0.9694
4	12.45	115000.0	32.0	115000.0	32.0	0.9667	0.9667
5	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
6	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
7	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
8	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
9	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
10	12.45	115000.0	32.0	115000.0	32.0	0.9660	0.9660
Avg		Avg		Avg		Avg	
						0.9708	

Y: Ratio of reading of reference to dry gas meter. Tolerance for individual values: ±0.02 from average.
Avg: Orifice pressure differential. Test requires: 10.21, 24 in. of air @ 25 °C and 750 mm of mercury. -1mmH2O. Tolerance for individual values: ± 0.08 from average.
Procedure: 40 CFR 60 APP A MET SEC 5.3 & 7
Calibrated by: N. S. (Mr. Naiton Suraporn)
Field Scientist (2)
Approved by: (Mr. Samart Rong-ngan)
Field Scientist (1)



Stopwatch Calibration Test Report

Calibration Date: 6 Jan 22
Bxometric Pressure (mmHg): 756
Relative Humidity (%): 66.0
Reference Stopwatch Data
Stopwatch ID No.: E18061
Model: F608
Serial No.:
Calibration Date: 8 Sep 20
Certificate No.: E 2009018
Next Cal. Date: 6 Jun 22
Temperature (°C): 32.0
Console Control Meter Data
Dry Gas Meter No.: BK_F50448
Model: XC-572-V
Serial No.: 1901983

Run No.	Time Actual (m:ss.ms)	Time Reading (m:ss)	Diff. (ms)	Diff. (min)
1	5:00:11	5:00	11	0.00018
2	5:00:11	5:00	11	0.00018
3	5:00:12	5:00	12	0.00020
4	5:00:10	5:00	10	0.00017
5	5:00:10	5:00	10	0.00017
6	5:00:11	5:00	11	0.00018
7	5:00:10	5:00	10	0.00017
8	5:00:12	5:00	12	0.00020
9	5:00:12	5:00	12	0.00020
10	5:00:11	5:00	11	0.00018
Average			0.00018	
SD			0.00001	

Calibrate by: (Signature)
Mr. Worawich Tongpoom
Field Scientist (2)
Approved by: (Signature)
Mr. Samart Rong-ngan
Specialist (1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	6 Jan 22	Ambient Temperature (°C) :	32
Calibration sheet No. :	C-060122-BRK-FS0449	Relative Humidity (%) :	68
Digital Temperature ID :	BRK_FS0449	Reference Temperature ID :	BRK_FS1144
Serial No. :	1901983	Serial No. :	201060006013
Model :	XC-572-V	Model :	Digicon-CC-VT-M5
		Next Calibrate :	31 Jan 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Block	0	1	1	
	25	26	1	
	50	51	1	
	100	101	1	
	150	151	1	
	200	201	1	
	250	252	2	
	300	302	2	
	500	502	2	
	1000	1002	2	
Probe	1200	1202	2	
	100	101	1	
	125	126	1	
Oven	150	151	1	
	100	101	1	
	125	126	1	
Filter	150	151	1	
	100	101	1	
	125	126	1	
Ext	150	151	1	
	0	1	1	
	10	11	1	
Meter	20	21	1	
	0	1	1	
	25	26	1	
AUX	50	51	1	
	0	1	1	
	25	26	1	
	50	51	1	

Calibrated by

Nakorn S.

(Mr Nakorn Sukjarn)
Field Scientist (3)

Approved by

[Signature]

(Mr Samart Roongnang)
Field Specialist (1)

FORM NO. 7-BK-003 REVISED NO. 1002 DATE 01-01-02



Pitot Tube Calibration Data

Pitot Tube Identification Number :	BRK_FS0452	Calibration Date :	6 Jan 22
Lab test duct Number :	258-1-13-01	Standard Pitot ID :	BRK_FS0441
Calibration Sheet No. :	C-060122-BRK-FS0452	Cp Standard :	0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A/B	Standard pitot tube (ΔP, mm H ₂ O)	Type s pitot tube (ΔP, mm H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C _p	0.842	0.842

$$C_{p(S)} = C_p \sqrt{\frac{\Delta P_{std}}{\Delta P_{(s)}}}$$

$$[C_{p(A)} - C_{p(B)}]_{max BE} \leq 0.01$$

$$Average deviation(A or B) = \frac{\sum [C_p(s) - C_{p(A or B)}]}{J} \quad max BE \leq 0.01$$

Calibrated by

Nakorn S.

(Mr Nakorn Sukjarn)
Field Scientist (3)

Approved by

[Signature]

(Mr Samart Roongnang)
Field Specialist (1)

FORM NO. 7-BK-003 REVISED NO. 1002 DATE 01-01-02



Pitot Tube Calibration Data

Pitot Tube Identification Number :	BRK_FS0453	Calibration Date :	6 Jan 22
Lab test duct Number :	258-1-13-01	Standard Pitot ID :	BRK_FS0441
Calibration Sheet No. :	C-060122-BRK-FS0453	Cp Standard :	0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A/B	Standard pitot tube (ΔP, mm H ₂ O)	Type s pitot tube (ΔP, mm H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C _p	0.842	0.842

$$C_{p(S)} = C_p \sqrt{\frac{\Delta P_{std}}{\Delta P_{(s)}}}$$

$$[C_{p(A)} - C_{p(B)}]_{max BE} \leq 0.01$$

$$Average deviation(A or B) = \frac{\sum [C_p(s) - C_{p(A or B)}]}{J} \quad max BE \leq 0.01$$

Calibrated by

Nakorn S.

(Mr Nakorn Sukjarn)
Field Scientist (3)

Approved by

[Signature]

(Mr Samart Roongnang)
Field Specialist (1)

FORM NO. 7-BK-003 REVISED NO. 1002 DATE 01-01-02



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date :	6 Jan 22	Nozzle Set ID :	BRK_FS0454
Calibration Sheet No. :	C-060122-BRK-FS0454	Vernier Caliper ID :	BRK_FS0626

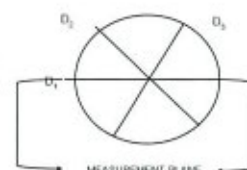
Nozzle ID #	Nozzle Diameter (cm.)			H ₁ L ₁ ΔD	(D ₁ + D ₂ + D ₃) / 3 D _{avg}
	D ₁	D ₂	D ₃		
1	0.315	0.315	0.315	0.000	0.315
2	0.475	0.475	0.475	0.000	0.475
3	0.635	0.635	0.635	0.000	0.635
4	0.790	0.790	0.790	0.000	0.790
5	0.950	0.950	0.950	0.000	0.950
6	1.110	1.110	1.110	0.000	1.110
7	1.270	1.270	1.270	0.000	1.270
8	1.600	1.600	1.600	0.000	1.600

Where

D₁, D₂, D₃ = Three 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

Nakorn S.

(Mr Nakorn Sukjarn)
Field Scientist (3)

Approved by

[Signature]

(Mr Samart Roongnang)
Field Specialist (1)

FORM NO. 7-BK-003 REVISED NO. 1002 DATE 01-01-02



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/64 PATTANAKARN ROAD SOI 10, SUKHUMVIT, SUKHUMVIT, BANGKOK 10259
TEL: 0-2717-3008-34 FAX: 0-2716-8484



Certificate of Calibration

Certificate No.: 20P5206
Page: 1 of 2

Equipment: Digital Vacuum Gauge

Manufacturer: Dwyer

Model: DPGA-00

Serial No.: DVG10

ID No.: BKK_F80545

Condition As-Received: Used Item

Received Date: 22 December 2020

Calibration Date: 23 December 2020

Reference: 2012-0709WSC

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.

Ambient Temperature: (23 ± 2) °C

104 Phatthanakan Rd., Phatthanakan Rd.,

Relative Humidity: (50 ± 15) %

Khwaeng Phatthanakan, Khet Suan Luang,

Atmospheric Pressure: 1010 mbar

Bangkok 10250 Thailand

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-008, using "DKD-R 6-1: Calibration of Pressure Gauges, Edition 020014" as a guideline.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Exp. Date
1) Pressure Calibrator	PC106P	1189	MP-0113-20	14 Jul 2021

2. This instrument was installed in vertical orientation and lower groove of pressure sensor was used as the reference level.

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

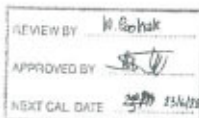
4. Scale and conversion factor is 1 kPa = 0.2953 inHg

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

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

7. This Certification is traceable to the International System of Unit maintained at-

-National Institute of Metrology Thailand (NIMT)



Calibrated by: Sukh Ausarnne
Issue Date: 25 December 2020

Approved Signatory:

| Phatree Pratsapai

| Sure Sunanap

| Atapol Panarch

0249553



Cert.No.: 20P5206
Page: 2 of 2

Result of calibration: Without adjustment

Baro: 0 inHg to -30 inHg

Function: Vacuum Pressure Measurement

Resolution: 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-4.995	-9.990	-14.984	-19.972	-24.957
UUC Indication (inHg)	0.00	-5.00	-10.00	-15.01	-20.02	-25.04
Error (inHg)	0.000	-0.002	-0.004	-0.016	-0.028	-0.053

Decreasing Pressure

Applied Pressure (inHg)	-24.957	-19.972	-14.984	-9.990	-4.995	0.000
UUC Indication (inHg)	-24.92	-20.00	-15.00	-10.01	-5.01	0.00
Error (inHg)	-0.033	-0.008	-0.006	-0.014	-0.012	0.000

The uncertainty of measurement was ± 0.060 inHg

* UUC = Unit Under Calibration

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

-08-

1034039



Bara Scientific Co., Ltd.
968 U Chu Long Building Floor 7 Ramat Road
Siam Bangkok Bangkok Thailand 10500
Tel: 02-6234300 Fax: 02-6374466-7
www.barscientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSQC-UV-28021

Equipment: UV-Vis Spectrophotometer

Model: UV-1800

Manufacturer: Shimadzu

Serial No. A11454098533CD

ID No. BKK_END018

Date of receipt: 15 October 2021

Date of calibration: 15 October 2021

Date of issue: 25 October 2021

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

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

Temperature: (25.0 ± 0.4) °C (On site)

Humidity: (49.5 ± 5.4) %RH (On site)

Equipment condition: Good Operation

Calibration Location: Organic Prep

Calibration Procedure: In-house method: W-UV-702-Q1 based on ASTM E275-01

Traceability: Wavelength Accuracy is traceable to certificate No. 87830 and 87844

Photometric Accuracy is traceable to certificate No. 87846 and 87877

Slit Light is traceable to certificate No. 87825

The above certificate is traceable to SI unit through Bara Scientific Ltd.

(UKAS accredited calibration laboratory NO. 0659)

Calibrated by: Mr. Wanchana Jantony

Approved by

Mr. Wanchana Jantony
Technical Manager

The above results are valid exclusively for the calibrated items as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
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Siam Bangkok Bangkok Thailand 10500
Tel: 02-6234300 Fax: 02-6374466-7
www.barscientific.com



Certificate of Calibration

Certificate No. BSQC-UV-28021

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.55	-0.15	0.18
334.02	333.80	-0.22	0.18
418.03	418.40	+0.37	0.18
572.99	572.85	-0.14	0.18
879.41	879.15	-0.26	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7174	0.7198	0.0024	0.0075
257	0.0000	-0.0001	-0.0001	0.0075
	0.8362	0.8377	0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2778	0.2803	0.0025	0.0075
350	0.0000	-0.0001	-0.0001	0.0075
	0.6202	0.6221	0.0019	0.0075

*QMR = Customer not request

The above results are valid exclusively for the calibrated items as mention in this report / certificate.
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Bara Scientific Co., Ltd.
968 U Chu Long Building Floor 7 Ramat Road
Silom Bangkok Bangkok Thailand 10500
Tel: 02-6324300 Fax: 02-6375456-7
www.barascientific.com



Certificate of Calibration

Certificate No. BSCC-UV-26021

Number of Page(s)

3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5631	0.5628	-0.0001	0.0042
	0.7296	0.7334	-0.0036	0.0042
	1.0853	1.0816	-0.0037	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5624	0.5468	-0.0055	0.0042
	0.7217	0.7166	-0.0051	0.0042
	1.0505	1.0570	-0.0065	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5016	0.4966	-0.0050	0.0042
	0.6687	0.6610	-0.0077	0.0042
	0.9775	0.9740	-0.0035	0.0042
545.1	0.0000	0.0000	0.0000	0.0042
	0.5147	0.5113	-0.0034	0.0042
	0.6743	0.6705	-0.0038	0.0042
	0.9909	0.9890	-0.0019	0.0042
550.0	0.0000	0.0000	0.0000	0.0042
	0.5427	0.5394	-0.0033	0.0042
	0.7037	0.7001	-0.0036	0.0042
	1.0338	1.0323	-0.0015	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5268	0.5235	-0.0033	0.0042
	0.6720	0.6685	-0.0035	0.0042
	0.9854	0.9847	-0.0007	0.0042

CNR = Customer not request

4. Stray Light

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC) Wavelength (nm)	Transmission (%)	Absorbance (A)
200 9140 11nm	200.31	0.9389	2.0274

The stray light transmission reference is less than 1.0% and stray light absorbance reference is greater than 2.0%.

Stray Light not NSC-ORIG Accredited.

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

End of Certificate

The above results are valid only for the conditions as stated in this report. Certificate and copy of the results are provided and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

FM UV 708-02 Rev 01 (23/01/2021)



DRY GAS METER CALIBRATION TEST REPORT

Calibration Date : 10 Jan 22

Next Calibration Date : 10 Jul 22

Barometric Pressure (mm Hg) : 760

Relative Humidity (%) : 65.0

Temperature (°C) : 30.0

Dry Gas Meter Data

Calibration sheet No. : C-100122-BK_F30404

Dry Gas Meter No. : BK_F30404

Serial No. : 1300025

Model No. : SX25EK

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID : BK_F31122

Serial No. : A2003240

Correction Factor (Y) : 1.0000

Next Calibration Date : 1 Mar 22

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter Correction
Vn (L/min)			Tn (°C)	Vn (L/min)			Ti (°C)	Ta (°C)	Avg. Tm (°C)	Factor (Y)
Final	Initial	Total		Final	Initial	Total				
30.00	0.00	30.00	29.8	30.98	0.00	30.98	29.8	29.8	29.8	0.9984
30.00	0.00	30.00	29.8	31.06	0.00	31.06	30.0	30.0	30.0	0.9906
60.00	0.00	60.00	30.0	62.13	0.00	62.13	32.0	32.0	32.0	0.9721
60.00	0.00	60.00	31.0	62.18	0.00	62.18	33.0	33.0	33.0	0.9713
90.00	0.00	90.00	31.0	93.21	0.00	93.21	34.0	34.0	34.0	0.9750
90.00	0.00	90.00	32.0	93.25	0.00	93.25	34.0	34.0	34.0	0.9714
Avg										0.9712

Y = Ratio of reading of reference dry gas meter to dry gas meter; reference for individual ± 0.02 from average

Calibrated by :

(Mr. Worawich Tongsom)
Field Scientist (2)

Approved by :

(Mr. Samart Boonngan)
Specialist (1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	10 Jan 22	Ambient Temperature (°C)	30	
Calibration sheet No. :	C-100122-BKK_F30404	Relative Humidity (%) :	65	
Digital Temperature ID	BKK_F30404	Reference Temperature ID	BKK_F31144	
Serial No. :	1300025	Serial No. :	20100000013	
Model :	XC-573-V	Model :	Digicon-CC-VT-MS	
		Next Calibrate	31 Jan 23	
Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	25	0	
	50	50	0	
	100	100	0	
	150	152	2	
	200	202	2	
	250	252	2	
	300	302	2	
	500	502	2	
	1000	1002	2	
Probe	1200	1202	2	
	100	100	0	
	125	125	0	
Filter	150	150	0	
	100	100	0	
	125	125	0	
Exit	150	150	0	
	0	1	1	
	10	11	1	
Meter	20	21	1	
	0	1	1	
	25	26	1	
ALUX	50	51	1	
	0	-1	-1	
	25	26	1	
	50	51	1	

Calibrated by :

(Mr. Worawich Tongsom)
Field Scientist (2)

Approved by :

(Mr. Samart Boonngan)
Specialist (1)

FORM UV 708-02 Rev 01 (23/01/2021)



Rotameter Calibration Report

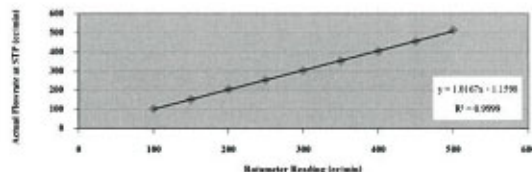
Calibration Date	10 Jan 22	Relative Humidity (%)	65.0
Rotameter ID	BK_F30405	Barometric Pressure (mmHg)	760
Calibration sheet No	C-100122-BK_F30405	Temperature (°C)	30.0

Primary Equipment Data

Brand	1	Brand	1	Model	1	Deflector 520 M
Serial No.	1	Serial No.	1	ID	1	BK_F30404

Calibration Data

Rotameter Reading (cc/min)	Actual Flowrate (cc/min)				Actual Flowrate at STP (cc/min)
	1	2	3	Avg.	
100	104.4	103.9	103.8	104.0	102.0
150	154.5	154.9	155.6	155.0	152.4
200	207.3	208.6	208.1	208.0	204.6
250	258.3	257.9	258.3	258.2	253.9
300	309.9	309.3	308.9	309.3	304.2
350	359.8	359.3	358.7	359.3	353.9
400	411.6	410.5	410.8	411.0	404.2
450	463.8	462.8	462.8	462.5	454.8
500	521.5	521.6	521.8	521.6	514.7



Calibrated by :

(Mr. Samart Boonngan)
Kavira Field Services Specialist (1)

Approved by :

(Mr. Wichai Chankhanat)
Kavira Field Services Assistant Manager

FORM UV 708-02 Rev 01 (23/01/2021)

Certificate of Calibration

Represent to Certificate of Calibration /PTC07/21161

Certificate No.: PTC07/21161 Page: 1 of 2
Equipment: Digital Balance Condition: Normal
Manufacturer: Sartorius Serial No: 38354165
Model: SECURA224-1S ID No: BKK_EN0309
Type of Balance: Single interval

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

Environment Condition: Temperature 23.8 °C ± 0.4 °C
Humidity 58.1 %RH ± 0.7 %RH
Air density 1.18 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakam 40, Phatthanakam Rd.,
Khwaeng Phatthanakam, Khet Suan Luang, Bangkok 10250.

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.
NSC-ORSC Accreditation No. : Calibration 0189

Date Received: December 16, 2021
Calibration Date: December 16, 2021
Issued Date: December 20, 2021
Calibration By: Mr. Keatsak Kerdto

REVIEW BY: *Sareyuth N.*
APPROVED BY: *KL AL*
NEXT CAL. DATE: 16/12/22



Mr. Keatsak Kerdto
(Mr. Keatsak Kerdto)
Reviewed by

Approved By: *Mr. Keatsak Kerdto*
(Mr. Keatsak Kerdto)
Laboratory Manager

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 the Expression of Uncertainty in Measurement (GUM). This effect that the results relate only to the items calibrated.
This calibration certificate shall not be reproduced except in full only, without written approval from Penta Calibration Co., Ltd.

PTC-FNC-01-02 / Rev.020

Represent to Certificate of Calibration /PTC07/21161

Certificate No.: PTC07/21161

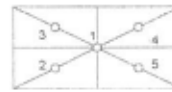
Page: 2 of 2

Measurement Results:

Without Adjustment:

Function Calibration: Internal Calibration

Eccentric Error Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 100 (g)

Position (g)				
1	2	3	4	5
0.0000	0.0000	0.0000	-0.0001	-0.0001
Maximum deviation: 0.0001				

Repeatability Test : Weight to be 1/2 ≤ L₁ ≤ Maximum capacity

Determination of the standard deviation of weighing balance. Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.0004

Error of Indication : from nominal value. Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00013	2.37
0.01	0.01000	0.0100	0.0000	0.00028	2.00
0.1	0.10000	0.1000	0.0000	0.00015	2.12
1	1.00000	1.0000	0.0000	0.00014	2.18
2	2.00000	2.0000	0.0000	0.00014	2.20
5	5.00001	5.0000	0.0000	0.00014	2.20
10	10.00000	10.0000	0.0000	0.00014	2.20
20	20.00003	20.0000	0.0000	0.00014	2.18
50	50.00004	50.0000	0.0000	0.00015	2.11
100	100.00004	100.0000	0.0000	0.00018	2.05
200	200.00011	200.0000	0.0001	0.00025	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC-FNC-01-02 / Rev.020

MULTIPOINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) CO., Ltd.
EQUIPMENT NAME : CO Analyzer
MANUFACTURER : Teledyne API MODEL : T300
STANDARD GAS CONCENTRATION (PPM) : 808.8
CYLINDER PRESSURE (PSI) : 1530
CERTIFIED BY : AIRGAS SPECIALTY GASES

REVIEW BY: *Sareyuth N.*
APPROVED BY: *Sareyuth N.*
NEXT CAL. DATE: 16/12/22

SERIAL NUMBER : 1758
CYLINDER NO : CC739672
CERTIFIED DATE : Nov 05, 2020
EXPIRED DATE : Nov 05, 2028

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.00	0.00	-
1	50.00	50.20	0.20	0.40
2	90.00	90.10	0.10	0.11
3	400.30	399.50	-0.80	-0.20
4	806.80	809.70	0.80	0.10
AVERAGE (%)				0.20

Calibration Results Graph

Y-axis: Reading Concentration (PPM)
X-axis: Input Concentration (PPM)
Equation: $y = 1.00057x - 0.09504$
 $R^2 = 1.00000$

Legend: ACTUAL CO (PPM), UPPER ACTUAL CO (PPM)

Calibrated By: *Mr. Keatsak Kerdto*
Approved By: *Mr. Keatsak Kerdto*

DATE: 14 Nov 2024

การตรวจสอบทางเทคนิค: *Mr. Keatsak Kerdto*
โทรศัพท์: 02-015-8887

บริษัท 388 ถนนวิภาวดีรังสิต แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์: 0-2015-8888 E-Mail: info@kinetics.co.th

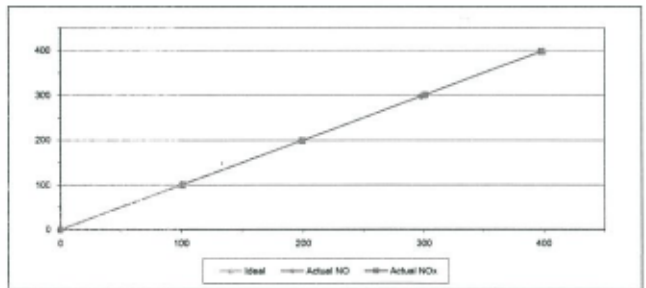


MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-22
Manufacturer: Teledyne API
Serial No.: 080
Calibrator Manufacturer: Teledyne API
Serial No.: 947
Std. Gas Concentration (PPM): 51.33
Cylinder Pressure (psi): 1200
Certified Date: 18-Mar-14

Equipment Name: NOx Analyzer
Model: T200
Equipment ID: BKK_FB0741
Model: 700
Cylinder No.: LL36633
Certified By: Airgas Inc.
Expired Date: 18-Mar-22

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	99.80	-0.20	-0.20	101.20	1.20	1.20
2	200.00	198.10	-1.90	-0.95	199.30	-0.70	-0.35
3	300.00	297.60	-2.40	-0.80	301.10	1.10	0.37
4	400.00	398.20	-1.80	-0.45	398.20	-1.80	-0.45
AVERAGE (%)				-0.46			0.17



Calibrated By

Approved By

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

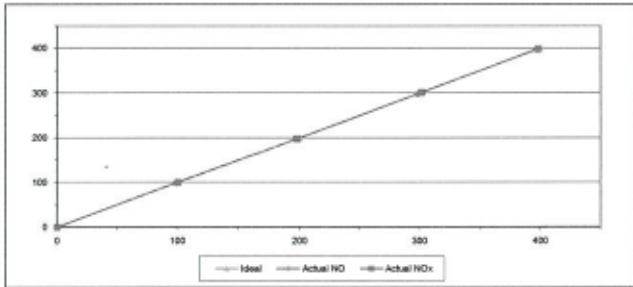
(Mr. Sareyuth Jitranont)
Assistant General Manager



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	PX13CWA0	Equipment ID	BKK_FS1008
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36633
Cylinder Pressure (psi)	1200	Certified By	Algae Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

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	99.00	-1.00	-1.00	100.30	0.30	0.30
2	200.00	198.30	-1.70	-0.85	199.10	-1.90	-0.95
3	300.00	298.40	-1.60	-0.53	301.70	1.70	0.57
4	400.00	396.70	-3.30	-0.83	396.30	-1.70	-0.42
AVERAGE (%)				-0.62			-0.08



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

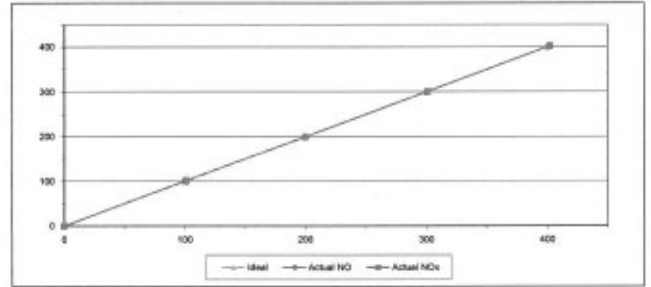
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. : ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	1993	Equipment ID	BKK_FS0728
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	51.33	Cylinder No.	LL36633
Cylinder Pressure (psi)	1200	Certified By	Algae Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

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	100.10	0.10	0.10	101.10	1.10	1.10
2	200.00	199.40	-0.60	-0.30	200.40	0.40	0.20
3	300.00	299.60	-0.40	-0.13	301.00	1.00	0.33
4	400.00	400.30	0.30	0.08	402.20	2.20	0.55
AVERAGE (%)				-0.03			0.46



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

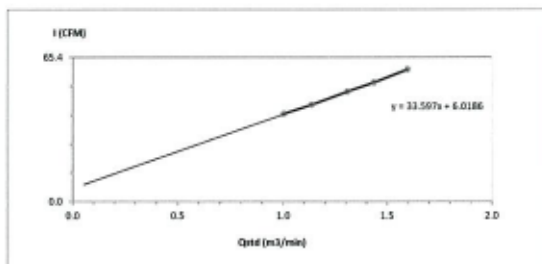
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. : ISSUE DATE: 02/04/12



High Volume Air Sampler Calibration Worksheet

Project Site :	B. Grieco BIP Power 1 Limited	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สุรนารี	Temperature (°C) :	33
Calibrate Date :	1-Mar-22	High Volume ID :	BKK FS0359
Calibration Sheet No. :	C-010322-BKK FS0359	High Volume Model :	TE-5009X
Calibrator ID# :	BKK FS0625	High Volume S/N :	5194
Calibrator Model :	TE-5028A	Calibrator Slope :	1.67326
Calibrator S/N :	2585	Calibrator Intercept :	-0.01954

Test No.	Delta H ₂ O (Inch)	Q _{gas} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.0945	40	Slope : 33.5670 Intercept : 6.0186 Correlation Coefficient : 0.9995
2	3.6	1.1363	46	
3	4.8	1.3991	50	
4	5.8	1.6371	56	
5	7.2	1.5989	60	



Calibrated by: Vannich P.
(Mr. Vannich Phasiphi)
Field Scientist(2)

Approved by: Wichon Choochuan
(Mr. Wichon Choochuan)
Manager

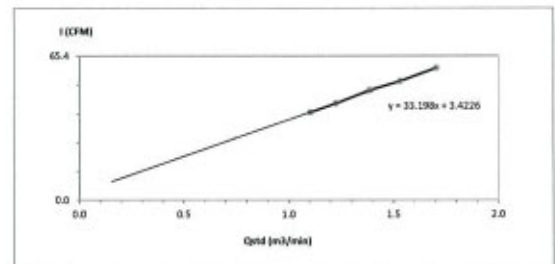
FORM NO. F-06-073 REVISION NO. : ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site :	B. Grieco BIP Power 1 Limited	Barometric Pressure (mm Hg) :	757
Calibrate Location :	สุรนารี	Temperature (°C) :	33
Calibrate Date :	1-Mar-22	High Volume ID :	BKK FS0367
Calibration Sheet No. :	C-010322-BKK FS0367	High Volume Model :	TE-5009X
Calibrator ID# :	BKK FS0625	High Volume S/N :	4162
Calibrator Model :	TE-5028A	Calibrator Slope :	1.67326
Calibrator S/N :	2585	Calibrator Intercept :	-0.01954

Test No.	Delta H ₂ O (Inch)	Q _{gas} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.4	1.1049	40	Slope : 33.1905 Intercept : 3.4226 Correlation Coefficient : 0.9993
2	4.2	1.2259	44	
3	5.4	1.3873	50	
4	6.6	1.5317	54	
5	8.2	1.7059	60	



Calibrated by: Vannich P.
(Mr. Vannich Phasiphi)
Field Scientist(2)

Approved by: Wichon Choochuan
(Mr. Wichon Choochuan)
Manager

FORM NO. F-06-073 REVISION NO. : ISSUE DATE: 14/03/16

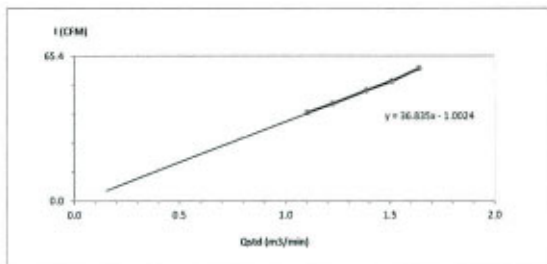


High Volume Air Sampler Calibration Worksheet

Project Site: E.Green RFP Power 1 Limited
 Calibrate Location: 251160/140/0002
 Calibrate Date: 1-Mar-22
 Calibration Sheet No.: C-010322-BKK PS0168
 Calibrator ID: BKK PS0168
 Calibrator Model: TE-5028A
 Calibrator S/N: 2505

Barometric Pressure (mm Hg): 757
 Temperature (°C): 33
 High Volume ID: BKK PS0168
 High Volume Model: TE-5028A
 High Volume S/N: 4165
 Calibrator Slope: 1.67336
 Calibrator Intercept: -0.01954

Test No.	Delta H ₂ O (inch)	Q _{air} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	3.4	1.1049	40	Slope: 36.8349
2	4.2	1.2250	44	Intercept: -1.0024
3	5.4	1.3873	50	Correlation Coefficient: 0.9986
4	6.4	1.5006	54	
5	7.6	1.6422	60	



Calibrated by: Vornich P. (Mr Vornich Pongpitt) Field Scientist(2)
 Approved by: Wichan Chokkharat (Mr Wichan Chokkharat) Manager

FORM NO. F 86-073 REVISION NO. - ISSUE DATE: 14/05/16



PENTA
CALIBRATION

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 Dokma Prueai Bangkok 10250
 Tel: +66 (0) 2069-8773
 www.pentalab.com

Certificate of Calibration

Represent to Certificate of Calibration /PTC/07/22072

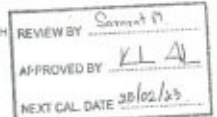
Certificate No.: PTC/07/22072 Page: 1 of 3
 Equipment: Digital Balance Condition: Normal
 Manufacturer: METTLER TOLEDO Serial No: 1123091884
 Model: XP105 ID No: BKK EN0004
 Type of Balance: Multi interval

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

Environment Condition: Temperature 21.0 °C ± 0.4 °C
 Humidity 62.8 %RH ± 3.7 %RH
 Air density 1.20 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.
 104 Phatthanakam 40 Phatthanakam Rd.,
 Khwaeng Phatthanakam, Khet Suan Luang, Bangkok 10250.

The Method used: In house method, PTC-W-07, base on Euramet cg 18
 Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd
 , NSQ-QNCS Accreditation No: Calibration 0189
 Date Received: February 25, 2022
 Calibration Date: February 25, 2022
 Issued Date: March 01, 2022
 Calibration By: Mr. Rungroo Metakul



Reviewed by: (Mr. Rungroo Metakul)
 Approved By: (Mr. Kiatkarn Kertlo) Laboratory Manager

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 standards 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). The effect that the results relate only to the items calibrated.
 This calibration certificate shall not be reproduced except in full, without written approval from Penta Calibration Co., Ltd.

PTC-FNC-01-01-1405-2016



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 www.pentalab.com

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Certificate No.: PTC/07/22072 Page: 2 of 3

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity

				
Eccentricity test		30	(g)	
Position (g)				
1	2	3	4	5
0.0000	0.0000	0.0000	0.0000	0.0000
Maximum deviation:			0.0000	

Repeatability Test: Weight to be 1/2 ≤ L ≤ Maximum capacity

Determination of the standard deviation of weighing balance: Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00005

Error of indication: from nominal value, Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
40	40.00005	40.0000	0.0000	0.00016	2.11
50	50.00001	50.0000	0.0000	0.00015	2.13
60	60.00003	60.0000	0.0000	0.00016	2.08
70	70.00003	70.0000	0.0000	0.00017	2.07
80	80.00005	80.0001	-0.0001	0.00019	2.04
90	90.00006	90.0001	0.0000	0.00020	2.03
100	100.00002	99.9999	0.0001	0.00018	2.06

Note: Weight of adjust (g)



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Certificate No.: PTC/07/22072 Page: 3 of 3

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity

				Eccentricity test 30 (g)	
Position (g)					
1	2	3	4	5	
0.00000	-0.00001	-0.00002	0.00000	0.00000	
Maximum deviation					0.00002

Repeatability Test: Weight to be 1/2 ≤ L ≤ Maximum capacity

Determination of the standard deviation of weighing balance: Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005

Error of indication: from nominal value, Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.000000	0.00000	0.00000	0.000016	2.57
0.1	0.099900	0.10000	0.00000	0.000019	2.00
0.5	0.499900	0.50000	0.00000	0.000019	2.00
2	2.000010	1.99999	0.00002	0.000024	2.00
5	5.000005	5.00001	0.00000	0.000027	2.00
10	10.000015	10.00001	0.00000	0.000031	2.00
20	20.000019	20.00001	0.00001	0.000042	2.00
30	30.000034	30.00008	-0.00003	0.000069	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC-FNC-01-01-1405-2016

PTC-FNC-01-01-1405-2016

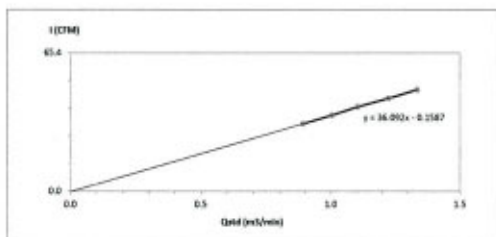


High Volume Air Sampler Calibration Worksheet

Project Site: B.Grimas BIP Power 1 Limited
 Calibrate Location: 0/036581/12006
 Calibrate Date: 1-Mar-22
 Calibration Sheet No.: C-010322-BKK_F50388
 Calibrator ID: BKK_F50625
 Calibrator Model: TE-5020A
 Calibrator S/N: 2585

Barometric Pressure (mm Hg): 757
 Temperature (°C): 33
 High Volume ID: BKK_F50388
 High Volume Model: TE-5009E
 High Volume S/N: 55031
 Calibrator Slope: 1.67326
 Calibrator Intercept: -0.01954

Test No.	Delta H ₂ O (inch)	Q _{air} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.8926	32	Slope: 36.0917 Intercept: -0.1587 Correlation Coefficient: 0.9997
2	2.8	1.0965	36	
3	3.4	1.2993	40	
4	4.2	1.2258	44	
5	5.0	1.3357	48	



Calibrated by: Vornich P.
 (Mr. Vornich Phangpiti)
 Field Scientist(2)

Approved by: Wichan Chokchait
 (Mr. Wichan Chokchait)
 Manager

FORM NO. F-06-074 REVISION NO.: ISSUE DATE: 14/03/16

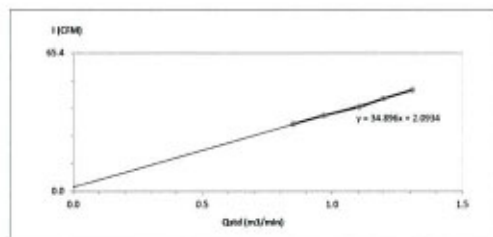


High Volume Air Sampler Calibration Worksheet

Project Site: B.Grimas BIP Power 1 Limited
 Calibrate Location: 0/036581/12006
 Calibrate Date: 1-Mar-22
 Calibration Sheet No.: C-010322-BKK_F50375
 Calibrator ID: BKK_F50625
 Calibrator Model: TE-5020A
 Calibrator S/N: 2585

Barometric Pressure (mm Hg): 757
 Temperature (°C): 33
 High Volume ID: BKK_F50375
 High Volume Model: TE-5009E
 High Volume S/N: 5196
 Calibrator Slope: 1.67326
 Calibrator Intercept: -0.01954

Test No.	Delta H ₂ O (inch)	Q _{air} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	0.8519	32	Slope: 34.9364 Intercept: 2.0934 Correlation Coefficient: 0.9903
2	2.6	0.9496	36	
3	3.4	1.1049	40	
4	4.0	1.2967	44	
5	4.8	1.3991	48	



Calibrated by: Vornich P.
 (Mr. Vornich Phangpiti)
 Field Scientist(2)

Approved by: Wichan Chokchait
 (Mr. Wichan Chokchait)
 Manager

FORM NO. F-06-074 REVISION NO.: ISSUE DATE: 14/03/16

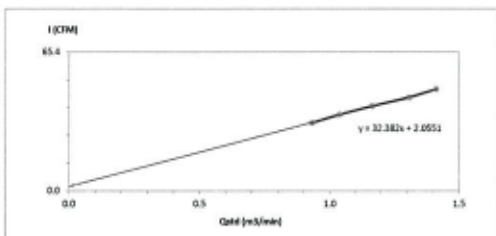


High Volume Air Sampler Calibration Worksheet

Project Site: B.Grimas BIP Power 1 Limited
 Calibrate Location: 0/036581/00000
 Calibrate Date: 1-Mar-22
 Calibration Sheet No.: C-010322-BKK_F50662
 Calibrator ID: BKK_F50625
 Calibrator Model: TE-5020A
 Calibrator S/N: 2585

Barometric Pressure (mm Hg): 757
 Temperature (°C): 33
 High Volume ID: BKK_F50662
 High Volume Model: TE-5009E
 High Volume S/N: 5486
 Calibrator Slope: 1.67526
 Calibrator Intercept: -0.01954

Test No.	Delta H ₂ O (inch)	Q _{air} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.4	0.9314	32	Slope: 32.3823 Intercept: 2.0551 Correlation Coefficient: 0.9987
2	3.0	1.0396	36	
3	3.8	1.1669	40	
4	4.0	1.3093	44	
5	5.6	1.4124	48	



Calibrated by: Vornich P.
 (Mr. Vornich Phangpiti)
 Field Scientist(2)

Approved by: Wichan Chokchait
 (Mr. Wichan Chokchait)
 Manager

FORM NO. F-06-074 REVISION NO.: ISSUE DATE: 14/03/16

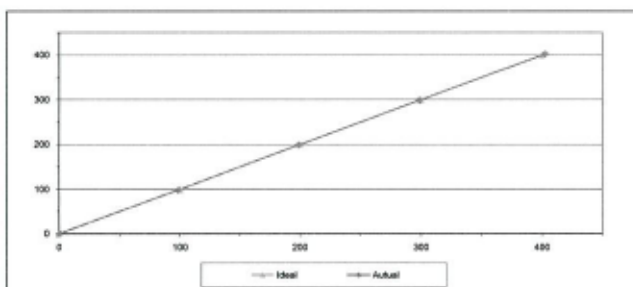


MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-22
 Manufacturer: Teledyne API
 Serial No.: 060
 Calibrator Manufacturer: Teledyne API
 Serial No.: 947
 Std. Gas Concentration (PPM): 50.87
 Cylinder Pressure (psi): 1200
 Certified Date: 18-Mar-14

Equipment Name: SO₂ Analyzer
 Model: T100
 Equipment ID: BKK_F50740
 Model: 700
 Cylinder No.: LL36633
 Certified By: Airgas Inc.
 Expired Date: 18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.50	-1.50	-1.50
2	200.00	199.00	-1.00	-0.50
3	300.00	298.50	-1.50	-0.50
4	400.00	402.00	2.00	0.70
AVERAGE (%)				-0.34



Calibrated By

Approved By

(Mr. Jirawat Sakorn)
 Field Environmental Scientist (3)

(Mr. Sarayuth Jittrantorn)
 Assistant General Manager

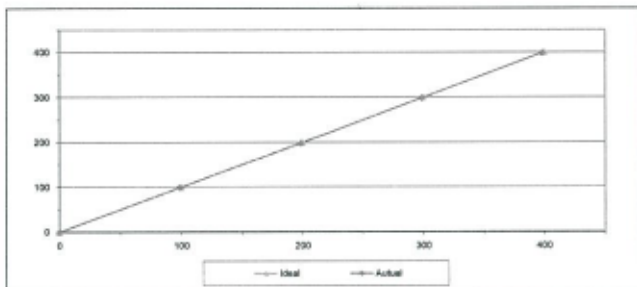
ALS Laboratory Group
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	XHV1559F	Equipment ID	BKK_FS1087
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	50.87	Cylinder No.	LL36833
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90
2	200.00	198.30	-1.70	-0.85
3	300.00	298.70	-1.30	-0.43
4	400.00	398.30	-1.70	-0.42
AVERAGE (%)				-0.50



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

ALS Laboratory Group

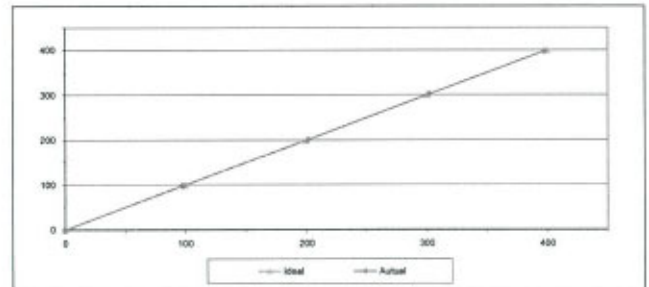
FORM NO: F-06-058 REVISION NO: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-22	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1809	Equipment ID	BKK_FS0727
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	50.87	Cylinder No.	LL36833
Cylinder Pressure (psi)	1200	Certified By	Airgas Inc.
Certified Date	18-Mar-14	Expired Date	18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.10	-1.90	-1.90
2	200.00	200.60	0.60	0.40
3	300.00	302.00	2.00	0.67
4	400.00	397.70	-2.30	-0.58
AVERAGE (%)				-0.28



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

ALS Laboratory Group

FORM NO: F-06-058 REVISION NO: - ISSUE DATE: 02/04/12



63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Watthapra, Banghokhai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812/13 Fax: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No. WD-01112001
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger

Manufacturer: Data logger: Anemys
Wind direction sensor: Nodalyte

Model/Type: Data logger: 700 WD-250 E
Wind direction sensor: WD-027

Serial Number: Data logger: A6377
Wind direction sensor:

ID No: Data logger: BKK FS0412
Wind direction sensor:

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasri 45, Phatthanasri Rd, Huaykhong San Luang, Khwaeng San Luang, Bangkok 10250
Thailand

Environmental Condition:
The measurement was carried out in an ambient temperature of (23±3) °C and relative humidity of 40±10 %

Measurement Method:
The wind direction sensor calibration according to comparison method with reference angle measurement standard method and the laser is used for angle control. The measurement was taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UAC was carried out for 1 hour prior to the calibration being performed.

Traceability:
The measurement results are traceable to the International System of Units (SI) through Certificate No. Q2108014. Certificate No.: WD0545025

Measurement Date: Nov 01, 2021
Issued Date: Nov 01, 2021

Performed by:
☒ Mr. Sarut Pracharad
☐ Mrs. Orathai Wanchaisak



Approved Signature: *[Signature]*
Mr. Panyee Boonchomern
Calibration Department Manager



63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Watthapra, Banghokhai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812/13 Fax: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No. WD-01112001
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ with adjustment
Calibration is in the range of 0 - 360 ° at a calibration interval of 45°.
The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UAC ¹ Reading (°)	Error (°)	Uncertainty (°)
1	Clockwise	0°/360°	359	359	-1	3.0
2		45	45	45	-4	3.0
3		90	90	87	-3	3.0
4		135	135	135	0	3.0
5		180	180	183	3	3.0
6		225	225	229	4	3.0
7	Counter Clockwise	270	270	274	4	3.0
8		315	315	320	5	3.0
9		0°/360°	359	359	-1	3.0
10		45	45	41	-4	3.0
11		90	90	87	-3	3.0
12		135	135	135	0	3.0
13		180	180	183	3	3.0
14		225	225	229	4	3.0
15		270	270	274	4	3.0
16		315	315	320	5	3.0

UAC¹: Unit Under Calibration. The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor for 95% providing a level of confidence of approximately 95%.

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No: WS-01112021
Page 1 of 2 pages

Measurement Item: : Cup anemometer with data logger
Manufacturer: : Data logger: Navysys
: Cup anemometer: Navysys
Model/Type: : Data logger: ZD-WD-2508
: Cup anemometer: WS-00P
Serial Number: : Data logger: A5377
: Cup anemometer: :
ID No: : Data logger: 886, #20817
: Cup anemometer: :
Customer: : R/S Laboratory group (Thailand) co., Ltd.
: 104 Phrasathan 40, Phrasathan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10350
Thailand
Test Conditions: : Wind tunnel cross section area: 900 cm²
: Anemometer frontal area: 130 cm²
: Diameter of mounting pipe: mm
: Backsight ratio of test object: 0.111 :1
Test Conditions: : Air temperature: 25.4 ±0.8 °C
: Air pressure: 1015.1 ±0.4 kPa
: Relative air humidity: 47.9 ±3.5 %RH
Calibration Procedure: : Calibration was carried out based on:
: ISO 9140-12-1 (G1) 2005 Power Performance Measurements of Electricity Producing Wind
Turbines
: ISO/IEC 17025:2005 Calibration Procedure - Version 2:2005
Traceability: : This calibration documents the traceability to national standards which relate the unit of
measurements according to the international system of units (SI) through National Institute of
Metrology (Thailand (NIMT))
Measurement Date: : Nov 01, 2021
Issued Date: : Nov 01, 2021

Calibrated by
☒ Mr. Sontak Thirachai
☐ Mr. Chirak Wutthasri



Approved Signature: *[Signature]*
Mr. Panyak Ruchanjan
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-01112021
Page 2 of 2 Pages

Result of calibration: ☒ without adjustment ☐ with adjustment
Calibration in the range of 1 ~ 15 m/s at a calibration interval of 3 m/s
The results of calibration and associated measurement uncertainties are reported in the table below

V _{ref} Reading m/s	V _{ref} Reading m/s	Error m/s	Uncertainty m/s
1.014	1.9	0.1	2.6
4.000	4.5	0.0	1.2
6.00	6.0	0.0	0.95
8.02	8.0	0.0	0.73
10.01	10.1	0.1	0.63
12.00	12.1	0.1	0.74
13.95	14.1	0.1	0.76
16.01	16.3	0.3	0.80
18.01	18.3	0.3	0.84
19.00	19.1	0.1	0.85
11.01	11.1	0.1	0.67
9.02	9.0	0.0	0.64
7.02	7.0	0.0	0.56
4.990	5.0	0.0	1.2
2.980	2.9	-0.1	1.8
0.990	0.9	-0.1	4.5

MUCH Ltd 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%

Appendix 1: Instrumentation

ID	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Flux gate	TECO INC	03572140	Aug 07, 2021	WS-0094-21	0 ~ 30 m/s
2	Pressure Differential Pressure Meter	Zepco	0702400	Aug 07, 2021	WS-0094-21	0 ~ 30 m/s
3	Air velocity transducer (hot wire)	TSI INC	5445-12	Aug 08, 2021	WS-0035-21	0 ~ 5 m/s
4	Temperature	Zepco	0591147	March 30, 2021	CL-027-24	30 ~ 70 °C
5	Relative humidity	Zepco	0591147	March 30, 2021	RH-030325-21	0 ~ 100 %RH
6	Atmospheric pressure	Zepco	0591147	March 30, 2021	PS-030325-21	850 ~ 1,050 kPa
7	Wind tunnel	LODGE	MP3500			0 ~ 60 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WS-02100201
Page 1 of 2 pages

Measurement Item: : Cup anemometer with data logger
Manufacturer: : Data logger: Navysys
: Cup anemometer: Navysys
Model/Type: : Data logger: ZD-WD-2508
: Cup anemometer: ZD-00P
Serial Number: : Data logger: A5182
: Cup anemometer: :
ID No: : Data logger: 886, #20823
: Cup anemometer: :
Customer: : R/S Laboratory group (Thailand) co., Ltd.
: 104 Phrasathan 40, Phrasathan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10350
Thailand
Test Conditions: : Wind tunnel cross section area: 900 cm²
: Anemometer frontal area: 130 cm²
: Diameter of mounting pipe: mm
: Backsight ratio of test object: 0.111 :1
Test Conditions: : Air temperature: 22.3 ±0.6 °C
: Air pressure: 1015.6 ±0.4 kPa
: Relative air humidity: 40.4 ±1.5 %RH
Calibration Procedure: : Calibration was carried out based on:
: ISO 9140-12-1 (G1) 2005 Power Performance Measurements of Electricity Producing Wind
Turbines
: ISO/IEC 17025:2005 Calibration Procedure - Version 2:2005
Traceability: : This calibration documents the traceability to national standards which relate the unit of
measurements according to the international system of units (SI) through National Institute of
Metrology (Thailand (NIMT))
Measurement Date: : Oct 08, 2021
Issued Date: : Oct 11, 2021

Calibrated by
☒ Mr. Sontak Thirachai
☐ Mr. Chirak Wutthasri



Approved Signature: *[Signature]*
Mr. Panyak Ruchanjan
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-02100201
Page 2 of 2 Pages

Result of calibration: ☒ without adjustment ☐ with adjustment
Calibration in the range of 1 ~ 15 m/s at a calibration interval of 3 m/s
The results of calibration and associated measurement uncertainties are reported in the table below

V _{ref} Reading m/s	V _{ref} Reading m/s	Error m/s	Uncertainty m/s
0.940	2.0	0.0	2.7
4.000	4.0	0.1	1.3
5.97	6.0	0.0	0.99
8.00	8.0	0.0	0.88
10.00	10.1	0.1	1.2
12.01	12.1	0.1	0.82
14.00	14.2	0.2	0.88
16.00	16.2	0.2	1.1
17.98	18.2	0.2	0.72
19.50	19.1	-0.1	0.84
11.01	11.0	0.0	1.1
9.01	9.0	0.0	0.88
7.01	7.0	0.0	1.1
5.000	5.1	0.1	0.96
2.998	3.0	0.0	1.7
1.007	0.9	-0.2	4.5

MUCH Ltd 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%

Appendix 1: Instrumentation

ID	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Flux gate	TECO INC	03572140	Aug 07, 2021	WS-0094-21	0 ~ 30 m/s
2	Pressure Differential Pressure Meter	Zepco	0702400	Aug 07, 2021	WS-0094-21	0 ~ 30 m/s
3	Air velocity transducer (hot wire)	TSI INC	5445-12	Aug 08, 2021	WS-0035-21	0 ~ 5 m/s
4	Temperature	Zepco	0591147	March 30, 2021	CL-027-24	30 ~ 70 °C
5	Relative humidity	Zepco	0591147	March 30, 2021	RH-030325-21	0 ~ 100 %RH
6	Atmospheric pressure	Zepco	0591147	March 30, 2021	PS-030325-21	850 ~ 1,050 kPa
7	Wind tunnel	LODGE	MP3500			0 ~ 60 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No. WD-02100021
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger

Manufacturer: Data logger: Naveya,
Wind direction sensor: Naveya

Model/Type: Data logger: ZD-05-06L3
Wind direction sensor: WD-02F

Serial Number: Data logger: A5380
Wind direction sensor: -

ID No: Data logger: BKK-K97020
Wind direction sensor: -

Customer: A/S Laboratory group (Thailand) Co., Ltd.
104 Phrasakorn 40, Phrasakorn Rd, Phrasakorn Sub District, Bangkok 10200
Thailand

Environmental Condition:
The measurement was carried out in an ambient temperature of 23±3°C and relative humidity of 40±10%

Measurement Method:
The wind direction sensor calibration according to comparison method with reference angle measurement fixture. Results and the item is used for wind control. The measurement was taken at 45° intervals in clockwise and counter-clockwise direction.

Note: The NAC was carried up for 1 hour prior to the calibration being performed.

Traceability:
The measurement results are traceable to the International system of units (SI) through Certificate No. CC553-07-0045.
Certificate No. RW554-0025

Measurement Date: 01.08.2021
Issued Date: 01.11.2021

Performed by:
☒ Mr. Surin Thairat
☐ Mr. Chaiyaporn Wuthikul



Mr. Petchkasem
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No. WD-02100021
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment
Calibration in the range of 0 - 360° at a calibration interval of 45°.
The results of calibration and associated measurement uncertainties are reported in table below.

ID	Ranking Direction	Nominal Angle (°)	Standard Reading (°)	UNC Reading (°)	Error (°)	Uncertainty (°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	42	-3	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	179	-1	3.0
6		225	225	225	0	3.0
7	Counter Clockwise	270	270	272	2	3.0
8		315	315	318	3	3.0
9		0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13	Clockwise	180	180	179	-1	3.0
14		225	225	225	0	3.0
15		270	270	272	2	3.0
16		315	315	318	3	3.0

UNC: 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 of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. WD-04012002
Page 1 of 2 pages

Measurement Item: Cup anemometer with data logger

Manufacturer: Data logger: Naveya,
Cup anemometer: Naveya

Model/Type: Data logger: ZD-05-06L3, D
Cup anemometer: WD-20F

Serial Number: Data logger: A5484
Cup anemometer: WD-020

ID No: Data logger: BKK-K97020
Cup anemometer: -

Customer: A/S Laboratory group (Thailand) Co., Ltd.
104 Phrasakorn 40, Phrasakorn Rd, Phrasakorn Sub District, Bangkok 10200
Thailand

Test Conditions:
Wind tunnel: anemometer sensor: 100 m/s
Anemometer: Naveya
Direction of measuring cup: 0°
Rotational rate of anemometer: 311.5 1/s

Test Conditions:
Air temperature: 24.4 ±0.5 °C
Air pressure: 1013.2 ±0.4 hPa
Relative air humidity: 58.8 ±3.5 %RH

Calibration Procedure:
Calibration was carried out using:
ISO 17025:2017, 6.2.1, 2000-First International Measurement of Uncertainty in Reporting
NAC's Uncertainty Calibration Procedure - Version 2.0000

Traceability:
The calibration results are traceable to the International system of units (SI) through National Institute of Standards and Technology (NIST).

Measurement Date: 01.08.2022
Issued Date: 01.11.2022

Calibrated by:
☒ Mr. Surin Thairat
☐ Mr. Chaiyaporn Wuthikul



Approved Signature: Mr. Petchkasem
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No. WD-04012002
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
Calibration in the range of 0 - 18 m/s at a calibration interval of 1 m/s.
The results of calibration and associated measurement uncertainties are reported in table below.

V _{ref} Reading m/s	V _{unc} Reading m/s	Error (m/s)	Uncertainty (m/s)
2.075	2.0	0.1	2.4
4.155	4.1	0.5	1.8
6.235	6.0	0.5	0.94
8.315	8.0	0.5	0.71
10.395	10.0	0.1	0.1
12.475	12.2	0.2	0.68
14.555	14.3	0.3	0.61
16.635	16.1	0.3	0.4
18.715	18.1	0.1	0.2
20.795	20.1	0.1	0.43
22.875	22.1	0.1	0.27
24.955	24.1	0.1	0.44
27.035	26.1	0.1	0.2
29.115	28.1	0.1	0.4

UNC: 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%.

Appendix 1: Reference Data

ID	Device	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Wind tunnel	ISO 17025	ISO 17025	Aug 07, 2021	WB-0004-01	0 - 30 m/s
2	Reference Wind Tunnel Sensor	ISO 17025	ISO 17025	Aug 07, 2021	WB-0004-01	0 - 30 m/s
3	Reference Wind Tunnel Sensor	ISO 17025	ISO 17025	Aug 08, 2021	WB-0005-01	0 - 30 m/s
4	Temperature	ISO 17025	ISO 17025	Aug 08, 2021	WB-0005-01	0 - 30 °C
5	Relative Humidity	ISO 17025	ISO 17025	Aug 08, 2021	WB-0005-01	0 - 100 %RH
6	Air Pressure	ISO 17025	ISO 17025	Aug 08, 2021	WB-0005-01	100 - 1100 hPa
7	Wind Tunnel	ISO 17025	ISO 17025	Aug 08, 2021	WB-0005-01	0 - 30 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-04012022
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger

Manufacturer : Data logger: Novolyne
Wind direction sensor: Novolyne

Model/Type : Data logger: 110-WD-25DL-D
Wind direction sensor: WS-02F

Serial Number : Data logger: A5444
Wind direction sensor: WSD-003

ID No : Data logger: RPO-F50435
Wind direction sensor:

Customer : A/S laboratory group (Thailand) Co.Ltd.
104 Phatthanasarn 40, Phatthanasarn Rd,Khuang Suay Luang, Khro Suay Luang, Bangkok 10250
Thailand

Environmental Condition:

The measurement was carried out in an ambient temperature of 23±3°C and relative humidity of 40±10 %.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the spin is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed.

Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No: Q21056014, Certificate No: W056400025.

Measurement Date : JAN 25, 2022
Issued Date : JAN 31, 2022

Performed by:

☒ Mr. Soravit Thachad
☐ Mrs. Chaiwit Wathachaiya



Approved Signatory:

[Signature]

Mr. Panyia Booncharoen
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-04012022
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.
Calibration in the range of 0 ~ 360 ° at a calibration interval of 45°.
The results of calibration and associated measurement uncertainties are reported in table below:

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/240	0	0	0	3.0
2		45	45	41	-4	3.0
3		90	90	87	-3	3.0
4		135	135	133	-2	3.0
5		180	180	180	0	3.0
6		225	225	227	2	3.0
7	Counter Clockwise	270	270	272	2	3.0
8		315	315	317	2	3.0
9		0/360	0	0	0	3.0
10		45	45	41	-4	3.0
11		90	90	87	-3	3.0
12		135	135	133	-2	3.0
13		180	180	180	0	3.0
14		225	225	227	2	3.0
15		270	270	272	2	3.0
16		315	315	317	2	3.0

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 of Calibration



CALIBRATION REPORT

Calibration No: R0-04012022
Page 1 of 1 Page

Measurement Item : Relative humidity with data logger

Manufacturer : Data logger: Novolyne
Relative humidity sensor: Novolyne

Model/Type : Data logger: 110-WD-25DL-D
Relative humidity sensor: RH750

Serial Number : Data logger: A5444
Relative humidity sensor: RH131112

ID No : Data logger: RRP-F50435
Relative humidity sensor:

Customer : A/S laboratory group (Thailand) Co.Ltd.
104 Phatthanasarn 40, Phatthanasarn Rd,Khuang Suay Luang, Khro Suay Luang, Bangkok 10250
Thailand

Environmental Condition:

The measurement was carried out in an ambient temperature of 23±3°C and relative humidity of 40±10%.

Measurement Method:

The Relative humidity with data logger, Unit Under Calibration (UUC) was calibrated by comparison method with the equivalent of standard salt solution (CH₃COOK Potassium Acetate, MgSO₄ Magnesium Nitrate, KO₂ Potassium Chloride) to determine the errors.

Measurement Date : JAN 24, 2022
Issued Date : JAN 25, 2022

Measurement Results:

The results of calibration are reported in table below.

Standard salt solution	Standard RH(%)	UUCReading	Error
CH ₃ COOK Potassium Acetate	22.51	22.3	-0.2
MgSO ₄ Magnesium Nitrate	53.62	52.8	-0.4
KO ₂ Potassium Chloride	84.34	84.1	-0.2

Performed by:

☐ Mr. Soravit Thachad
☒ Mrs. Chaiwit Wathachaiya



Approved Signatory:

[Signature]

Mr. Panyia Booncharoen
Calibration Department Manager

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CALIBRATION REPORT

Calibration Number : R0-04012022
Page 1 of 2 Pages

Measurement Item : Rain gauge with 300 mm

Manufacturer : Data logger: Novolyne
Rain gauge: Novolyne

Model/Type : Data logger: 110-WD-25DL-D
Rain gauge: 110-WD-25DL-D

Serial Number : Data logger: A5444
Rain gauge: R0-003

ID No : RPO-F50435

Customer : A/S laboratory group (Thailand) Co.Ltd.
104 Phatthanasarn 40, Phatthanasarn Rd,Khuang Suay Luang, Khro Suay Luang, Bangkok 10250, Thailand

Environmental Condition:

The measurement was carried out in an ambient temperature of 23±3°C and relative humidity of 40±10%.

Measurement Method:

The Rain gauge Unit Under Calibration (UUC) was calibrated by Precision reference bottle with flow adjuster at low rate 0.5 mm per minute or 1 liter every 20 seconds. The filling number was determined by procedure below:

1. Collect rain gauge from site.
Rain gauge inside diameter is cm = Diameter (D) = R (radius)
Rain gauge area= R²×14 (UUC diameter=20.3 cm, UUC radius=10.15 cm)
Rain gauge area= 323.6 cm²
2. Obtain theoretical correct rain gauge shower number of filling by using 323.6 cm² rain area and 0.5 L of rain.
a) 10000 cm³ ÷ 323.6 cm² = 30.90 (rain gauge area = 1/30.90 of square meter)
b) 30.90 × 0.5 L volume= 15.45 mm (mm of rain over 1 m² surface) 500 mm of rain volume on the rain gauge area = 15.45 mm of rain.
c) Number of filling= 15.45 ÷ 0.25 mm= 62 fillings

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

Measurement Date : JAN 26, 2022
Issued Date : JAN 31, 2022

Performed by:

☒ Mr. Soravit Thachad
☐ Mrs. Chaiwit Wathachaiya



Approved Signatory:

[Signature]

Mr. Panyia Booncharoen
Calibration Department Manager

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63/14-15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,
Wathapra, Bangkok, Bangkok 10600 Thailand.
Tel: (66) 02-8680812 Fax: (66) 02-8680860 www.jnac.co.th

Continuation of Calibration of Calibration Number

Calibration Number: RD-04012022
Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
The results of calibration are reported in table below:

Quantity of H ₂ O (ml)	Determined Tipping	Tipping count	Acceptable Tipping count
500	62	64	60 - 64
500	62	63	60 - 64
500	60	60	60 - 64
500	62	63	60 - 64
500	62	62	60 - 64

Remark: The procedure is made to verify the correct reading of the unit under calibration rain gauge when a precise volume of water falls into its cups. We suggest that the number of tipping should be within ±2% different from the 62 tipping turned range 60-64 tipping. It means that the rain gauge made be manufacture acceptable unit.

End of calibration report



Prakote Associates Co., Ltd.
141/15, 17/15, 16
Petchkasem 7/1, Rd
Wathapra, Bangkok,
Bangkok 10600 Thailand
Tel: +66(0)2-8680812
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E-mail: jnac-calibration@prakote.com
Web site: www.jnac.co.th

Accredited calibration laboratory
ISO/IEC 17025:2017
Pressure measurement laboratory
MSC-TSI-715 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No.: CL-005-65

Page 1 of 2 Pages

MEASUREMENT ITEM: Digital barometer
MANUFACTURER: Novatym
MODEL/TYPE: 110 WS 256P
SERIAL NUMBER: A5444
ID NUMBER: RYG_F50435
CUSTOMER: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan Rd, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand
RECEIVED DATE: 12 Jan 2022
MEASUREMENT DATE: 29 Jan 2022
ISSUE DATE: 31 Jan 2022

Calibration procedure:
The pressure calibration was done by in-house calibration method as per CL-003 according to comparison method with Digital pressure calibrator based on OVD-8 0.1

Traceability:
The measurement results are traceable to the international system of units (SI) through MBMS06 which complies with the requirements of ISO/IEC 17025:2017, ANSI/ISO 2540-1 via Certificate number 201479

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

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date
Absolute Pressure Transducer	CPG2500	430038-L	201479	12 Sep 2022

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

3. Calibration conditions:

Pressure transmitting medium: Air
p(20°C, 1bar): 1.19 kg/m³
h: 0.080 m
T_{amb}: (23±2) °C
P_{ref}: 1000.5 mbar

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

Calibrated by:
☒ Mr. Sorawit Thachulad
☐ Miss Oratla Wootwitaya



Approved signature:
Mr. Porinya Booncharoen
Calibration Department Manager

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Continuation of Certificate of Calibration Number CL-005-65

Page 2 of 2 Pages

MEASUREMENT RESULTS: ☒ Without adjustment ☐ With adjustment
CALIBRATION IN THE RANGE OF: 950 - 1050 mbar

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

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty(k=2) (mbar)
950.32	951.181	0.866	1.3
970.14	970.682	0.538	0.70
990.05	990.524	0.470	0.58
1000.95	1010.106	0.157	0.34
1029.84	1029.546	-0.307	0.25
1049.78	1049.594	-0.190	0.35

Note: UUC* Unit Under Calibration

End of certificate



63/14-15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,
Wathapra, Bangkok, Bangkok 10600 Thailand.
Tel: (66) 02-8680812 Fax: (66) 02-8680860 www.jnac.co.th



CERTIFICATE OF CALIBRATION

Certificate No.: CL-004-65
Page 1 of 2

Equipment Name: Data Logger with Temperature Sensor
Manufacturer: Novatym
Model: 110 WS 250L D
Serial No.: A5444
ID No.: RYG_F50435

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

Received date: 12 JAN 2022
Calibration date: 24 JAN 2022
Issue date: 25 JAN 2022

Reference Used During Calibration:
1. Standard Temperature Probe Model: STS-100 4500
Serial No.: 667682 09 Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DTI 3000 A NH
H. Serial No.: 671407 00591 Due date: 04 June 2022

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

Calibration Procedure:
The temperature calibration was done by in-house calibration method as per CL-003 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale used 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 0036 21. Certificate number: ER 0032 21

Calibrated by:
☒ Mr. Sorawit Thachulad
☐ Mr. Chaitan Wootwitaya



Approved Signature:
Mr. Porinya Booncharoen
Calibration Department Manager

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Certificate No.: CL-004-05
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 : HM160 S/N : R1131114
Dimension : Diameter 12mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	U/C Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.053	19.8	-0.3	0.099
60	25.006	24.5	-0.5	0.099
60	29.995	29.5	-0.5	0.099
60	34.976	34.4	-0.6	0.099
60	39.957	39.3	-0.7	0.099

U/C*: 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%.



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CERTIFICATE OF CALIBRATION

Certificate No. WD-0460031
Page 1 of 2 pages

Measurement Item: 1 Cup anemometer with data logger

Manufacturer: Data logger: Novolyte
Cup anemometer: Novolyte

Model/Type: Data logger: D00-001-001
Cup anemometer: WS-001

Serial Number: Data logger: A8378
Cup anemometer: -

ID No: Data logger: BPH_150218
Cup anemometer: -

Customer: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasri 40 Phatthanasri Rd. Khlong Suan Luang, Khlong Suan Luang, Bangkok 10330
Thailand.

Test Conditions: Wind tunnel: small test section area: 900 m²
Anemometer: large area: 130 m²
Diameter of anemometer: 100 mm
Average value of test object: 0.113 [1]

Test Conditions: Air temperature: 22.6 ± 0.6 °C
Air pressure: 1013.3 ± 0.4 hPa
Relative air humidity: 52.4 ± 0.5 %RH

Calibration Procedure: ISO 9001:2015 and ISO 17025:2017
ISO 9001:2015 1.4.2.1 - 2003 Four-Parameter Measurements of Velocity, Pressure, Wind
Turbulence
ISO 9001:2015 8.5.6.2 Calibration Procedure - Version 2.000

Traceability: This calibration documents the traceability to national standard, which issues the unit of
measurements according to the International system of units (SI) through National Institute of
Metrology (Thailand 1997).

Measurement Date: Aug 25, 2021
Issue Date: Aug 21, 2021

Calibrated by:
☒ Mr. Sornchai Thachai
☐ Miss Chaitree Wuthakarn



Approved Signature: M. Panya Boonchaisri
Technical Support
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No. WD-0560201
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
Calibration in the range of 1 - 15 m/s at a calibration interval of 1 m/s.
The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} Reading m/s	V _{ref} Reading m/s	Error (m/s)	Uncertainty (m/s)
2.521	1.5	-0.2	2.2
4.074	3.0	-0.7	1.6
6.06	4.0	-0.5	0.9
8.21	6.0	-0.5	0.84
10.03	8.0	-0.7	0.86
11.96	10.0	-0.5	0.85
13.99	12.0	-0.4	0.87
16.00	14.0	-0.6	0.88
18.20	16.0	-0.5	0.89
20.49	18.0	-0.4	0.87
22.87	20.0	-0.8	0.87
25.31	22.0	-0.9	0.90
27.88	24.0	-1.1	0.96
30.53	26.0	-0.5	1.2
33.28	28.0	-0.3	1.4

U/C*: 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%.

Appendix 1: Instrumentation

ID	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Flow rate	TECNO	QD10148	Aug 07, 2021	MA-003421	0 - 30 m/s
2	Pressure (Dynamic Pressure)	Depco	QD10150	Aug 07, 2021	MA-003421	0 - 20 m/s
3	Air velocity (average flow rate)	TECNO	QD10148	Aug 07, 2021	MA-003421	0 - 30 m/s
4	Temperature	Depco	QD10148	Aug 07, 2021	MA-003421	0 - 50 °C
5	Relative humidity	Depco	QD10148	Aug 07, 2021	MA-003421	0 - 100 %RH
6	Air pressure (static)	Depco	QD10148	Aug 07, 2021	MA-003421	0 - 1100 hPa
7	Wind tunnel	CSO	MP1000			0 - 60 m/s

End of certificate of calibration



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CERTIFICATE OF CALIBRATION

Certificate No. WD-0706201
Page 1 of 2 pages

Measurement Item: 1 Wind direction sensor with data logger

Manufacturer: Data logger: Novolyte
Wind direction sensor: Novolyte

Model/Type: Data logger: D00-001-001
Wind direction sensor: WS-001

Serial Number: Data logger: A8378
Wind direction sensor: -

ID No: Data logger: BPH_150218
Wind direction sensor: -

Customer: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanasri 40 Phatthanasri Rd. Khlong Suan Luang, Khlong Suan Luang, Bangkok 10330
Thailand.

Environmental Condition: The measurement was carried out in an ambient temperature of 23±0.5°C and relative humidity of 45±10%.

Measurement Method: The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and
the sensor is used for air control. The measurement was taken at 45° intervals in clockwise and counterclockwise
directions.

Note: The U/C was verified on Apr 1 hour prior to the calibration being performed.

Traceability: The measurement results are traceable to the International system of units (SI) through Certificate No. 00563-07-0045.
Certificate No. WD0530044.

Measurement Date: Aug 30, 2021
Issue Date: Aug 31, 2021

Performed by:
☒ Mr. Sornchai Thachai
☐ Miss Chaitree Wuthakarn



Approved Signature: M. Panya Boonchaisri
Technical Support
and Calibration Manager

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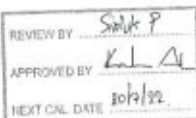


TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD 501 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-9800 FAX. 0-2719-6484

Cert.No.: 21TW6
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 15L103204
ID No. : BKK_ENC005
Received Date : 15 January 2021
Test Date : 19 January 2021
Reference : 2101-0428WSC-5
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd.,
Khwaeng Phatthanasak, Khet Suan Luang,
Bangkok 10250 Thailand
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In-house method : CP-C18
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithoon
Approved by :
Approved Signatory
(/) Malee Butruasa
(/) Sathip Meangmai
(/) Warakorn Lempagrakul
Issue Date : 25 January 2021



A 0251901



Cert.No.: 21TW6
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 18C100772

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.10	8.10	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 1037070



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TEL. 0-2717-9800 FAX. 0-2719-6484



Cert. No.: 21TM166
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5100
Serial No. : 15L103204
ID No. : BKK_ENC005
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd.,
Khwaeng Phatthanasak, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 15 January 2021
Calibrated Date : 21 January 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kritsada Chairong
Approved by :
Approved Signatory
(/) Pannthip Tameyakul
(/) Malee Butruasa
(/) Suwit Injai
Issue Date : 28 January 2021



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2101-0428WSC-6
Cert. No.: 21TM166
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

- Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2108080	201389	20 Nov 2021
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit maintained at:-
- National Institute of Metrology (NIMT)

Result of Calibration : (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 18C100772

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (±°C)	Coverage Factor
20.00	60	20.002	19.94	-0.062	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 %.

-00-

A 1038215

The Uncertainties are for a confidence probability of approximately 95%

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A 0023875



Metrological Center

SCI ECO Services Company Limited

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

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



Certificate No. T212123

Page 1 of 3

Certificate of Calibration

Equipment : Chamber (Incubator)

Manufacturer : SHEL LAB

Model : 2020-2E

Serial No. : 802899

Customer Code : BKK_EN0005

ID No. : T7499A0

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab2

Date of Receipt : 1 October 2021

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

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

Date of Issue : 07 OCT 2021

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 117-01-02-64



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Certificate No. T212123

Page 2 of 3

Calibration Report

Equipment : Chamber (Incubator)

Date of Calibration : 4-5 October 2021

Environment : Temperature : 23.8-24.9 °C

Line Voltage : 227.5-231.1 V

Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to W-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
RTD	100 ohm	29-CH1-10	T210118	2 February 2022
DATA LOGGER	34970A	T47	T210118	2 February 2022

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant	2 Hour	20 Minute	At 20 °C
Fresh Air Damper	<input type="checkbox"/> Open	<input type="checkbox"/> Min	<input type="checkbox"/> Medium <input type="checkbox"/> Max
	<input type="checkbox"/> Close		
	<input checked="" type="checkbox"/> Not Available		

5. Adjustment :

() without adjustment

(X) after adjustment

Approved By : [Signature]

FM-L15 117-15-05-63



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SCI ECO Services Company Limited

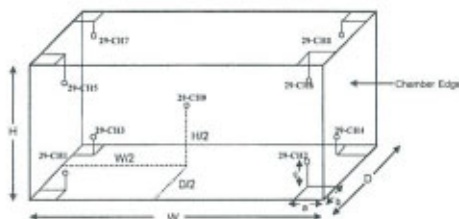
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Certificate No. T212123

Page 3 of 3

Calibration Report



Remark :

Internal Dimensions of Chamber : W (Width) = 70 cm , H (Height) = 130 cm and D (Depth) = 55 cm.
Size of installed Standard sensor number 29-CH1 to number 29-CH9 : a = 5 cm , b = 5 cm and c = 5 cm.
Size of installed Standard sensor number 29-CH1 : W/2 = 70 cm/2 , H/2 = 130 cm/2 and D/2 = 55cm/2

Measurement Results

Average Standard Reading at each position (°C)

Calibration Point	29-CH1	29-CH2	29-CH3	29-CH4	29-CH5	29-CH6	29-CH7	29-CH8	29-CH9
20	20.04	20.06	20.19	19.86	19.68	20.08	20.12	19.80	20.07
25	24.99	25.06	25.18	24.89	24.74	25.12	25.16	24.90	25.10

Chamber (Incubator)			Temperature Distribution			
Setting (°C)	Reading (°C)		Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Coverage Factor k
	Min	Max				
20.0	-	20.0	0.05	1.01	0.36	2.00
25.0	-	25.0	0.07	0.96	0.36	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 : [Signature]

FM-L15 117-15-05-63



Metrological Center

SCI ECO Services Company Limited

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

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

Certificate No. T220630

Page 1 of 5

Certificate of Calibration

Equipment : HOT BLOCK

Manufacturer : Environmental Express

Model : B3000- 240

Serial No. : 2017CODW116

Customer Code : BKK_EN0222

ID No. : T6769A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab2

Date of Receipt : 21 March 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : [Signature] / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 03 APR 2022

The uncertainties are for a confidence probability of approximately 95%.

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FM-L12 109-30-05-57



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

Certificate No. T220630

Page 2 of 5

Calibration Report

Equipment : HOT BLOCK
Date of Calibration : 21 March 2022
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 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 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	TN51-TN60	T220275	28 February 2023
TC	TYPE T	TN61-TN70	T220275	28 February 2023
DATA LOGGER	34930A	T47	T220275	28 February 2023

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 150 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By.

FM-L13 308-20-05-57



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Certificate No. T220630

Page 3 of 5

Calibration Report

R7	49	50	51	52	53	54	55	56
R6	41	42	43	44	45	46	47	48
R5	33	34	35	36	37	38	39	40
R4	25	26	27	28	29	30	31	32
R3	17	18	19	20	21	22	23	24
R2	9	10	11	12	13	14	15	16
R1	1	2	3	4	5	6	7	8

Controller

○ STANDARD THERMOCOUPLE TYPE T

No.1 = TN51	No.13 = TN63	No.25 = TN55	No.37 = TN67	No.49 = TN59
No.2 = TN52	No.14 = TN64	No.26 = TN56	No.38 = TN68	No.50 = TN60
No.3 = TN53	No.15 = TN65	No.27 = TN57	No.39 = TN69	No.51 = TN61
No.4 = TN54	No.16 = TN66	No.28 = TN58	No.40 = TN70	No.52 = TN62
No.5 = TN55	No.17 = TN67	No.29 = TN59	No.41 = TN51	No.53 = TN63
No.6 = TN56	No.18 = TN68	No.30 = TN60	No.42 = TN52	No.54 = TN64
No.7 = TN57	No.19 = TN69	No.31 = TN61	No.43 = TN53	No.55 = TN65
No.8 = TN58	No.20 = TN70	No.32 = TN62	No.44 = TN54	No.56 = TN66
No.9 = TN59	No.21 = TN51	No.33 = TN63	No.45 = TN55	
No.10 = TN60	No.22 = TN52	No.34 = TN64	No.46 = TN56	
No.11 = TN61	No.23 = TN53	No.35 = TN65	No.47 = TN57	
No.12 = TN62	No.24 = TN54	No.36 = TN66	No.48 = TN58	

Approved By.

FM-L13 308-20-05-57



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Certificate No. T220630

Page 4 of 5

Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)							
CAL POINT	R1	TN51	TN52	TN53	TN54	TN55	TN56	TN57	TN58
	Max	149.42	150.39	149.18	149.91	150.93	150.58	151.54	150.13
	Min	149.27	150.13	148.31	149.65	150.72	150.39	151.43	149.97
	Average	149.35	150.27	148.81	149.78	150.83	150.48	151.49	150.05
150	R2	TN59	TN60	TN61	TN62	TN63	TN64	TN65	TN66
	Max	150.66	150.45	151.06	151.76	150.66	150.67	151.73	149.65
	Min	150.46	150.16	150.74	151.51	150.48	150.48	151.56	149.43
	Average	150.56	150.31	150.97	151.63	150.57	150.58	151.65	149.52
	R3	TN67	TN68	TN69	TN70	TN51	TN52	TN53	TN54
	Max	150.90	151.18	151.10	151.95	150.16	150.55	149.86	150.39
	Min	150.68	151.08	150.84	150.75	149.36	149.17	148.95	149.17
	Average	150.79	151.08	150.97	150.90	149.76	149.85	149.41	149.78
	R4	TN55	TN56	TN57	TN58	TN59	TN60	TN61	TN62
	Max	150.82	150.07	151.03	150.72	150.35	149.76	150.24	150.04
	Min	149.53	149.73	149.57	148.67	148.46	148.85	149.55	148.81
	Average	150.17	149.89	150.60	149.70	149.41	149.32	149.50	149.42
	R5	TN63	TN64	TN65	TN66	TN67	TN68	TN69	TN70
	Max	150.00	149.68	150.31	149.66	150.24	150.40	150.09	149.31
	Min	149.81	149.58	149.69	149.42	149.20	149.40	149.60	149.18
	Average	149.90	149.63	149.90	149.54	149.77	150.04	149.89	149.44
	R6	TN51	TN52	TN53	TN54	TN55	TN56	TN57	TN58
	Max	149.23	150.37	148.55	149.86	150.91	150.64	151.12	149.83
	Min	149.07	150.15	148.28	148.78	150.69	149.83	150.95	149.65
	Average	149.16	150.26	148.41	148.82	150.80	149.94	151.04	149.74
	R7	TN59	TN60	TN61	TN62	TN63	TN64	TN65	TN66
	Max	149.28	149.24	149.88	150.17	149.72	149.45	149.63	149.51
	Min	149.22	149.03	149.68	149.99	149.61	149.34	149.48	149.16
	Average	149.30	149.13	149.78	150.08	149.67	149.40	149.56	149.43

Approved By.

FM-L13 308-20-05-57



Metrological Center

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

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

Certificate No. T220630

Page 5 of 5

Calibration Report

Measurement Results:

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
150.0	149.9 , 150.1	150.0	1.04	1.44

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

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

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

Approved By.

FM-L13 308-20-05-57



Metrological Center

SCI ECO Services Company Limited

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

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

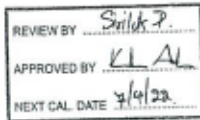
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T210717

Page 1 of 5

Certificate of Calibration

Equipment : HOT BLOCK
 Manufacturer : Environmental Expross
 Model : B300 240
 Serial No. : 2017CODW116
 Customer Code : BKK_EN0222
 ID No. : T6769A4
 Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
 Khet Suan Luang, Bangkok 10250
 Customer Location : Environmental Control & IP Room
 Date of Receipt : 1 April 2021
 Calibrated By : Atiphong Rongrat (Technician)
 Approved By : Bonchai Suriyawong (Site Calibration Manager)
 Date of Issue : 22 April 2021



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.

TN-113 108/20-05-57



Metrological Center

SCI ECO Services Company Limited

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

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

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

Certificate No. T210717

Page 2 of 5

Calibration Report

Equipment : HOT BLOCK
 Date of Calibration : 7 April 2021
 Environment : Temperature : 16.4-17.9 °C
 Line Voltage : 222.7-227.8 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	TN91-TN100	T202053	24 September 2021
TC	TYPE T	TN101-TN110	T202053	24 September 2021
DATA LOGGER	34970A	T121	T202053	24 September 2021

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant : Hour 40 Minute At 150 °C

Fresh Air Dumper : ☐ Open ☐ Min ☐ Medium ☐ Max

☐ Close

☒ Not Available

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By: Bonchai

TN-113 108/20-05-57



Metrological Center

SCI ECO Services Company Limited

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

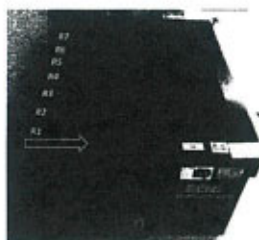
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

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

Certificate No. T210717

Page 3 of 5

Calibration Report



H: STANDARD THERMOCOUPLE TYPE T

Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H1	=	TN91	H9	=	TN99	H17	=	TN107	H25	=	TN95	H33	=	TN103	H41	=	TN91	H49	=	TN99
H2	=	TN92	H10	=	TN100	H18	=	TN108	H26	=	TN96	H34	=	TN104	H42	=	TN92	H50	=	TN100
H3	=	TN93	H11	=	TN101	H19	=	TN109	H27	=	TN97	H35	=	TN105	H43	=	TN93	H51	=	TN101
H4	=	TN94	H12	=	TN102	H20	=	TN110	H28	=	TN98	H36	=	TN106	H44	=	TN94	H52	=	TN102
H5	=	TN95	H13	=	TN103	H21	=	TN91	H29	=	TN99	H37	=	TN107	H45	=	TN95	H53	=	TN103
H6	=	TN96	H14	=	TN104	H22	=	TN92	H30	=	TN100	H38	=	TN104	H46	=	TN96	H54	=	TN104
H7	=	TN97	H15	=	TN105	H23	=	TN93	H31	=	TN101	H39	=	TN109	H47	=	TN97	H55	=	TN105
H8	=	TN98	H16	=	TN106	H24	=	TN94	H32	=	TN102	H40	=	TN110	H48	=	TN98	H56	=	TN106

Approved By: Bonchai

FM-113 108/20-05-57



Metrological Center

SCI ECO Services Company Limited

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

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

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

Certificate No. T210717

Page 4 of 5

Calibration Report

Measurement Results

Average Standard Reading at each position (°C)										
Calibration Point	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100
Point Setting	Min	150.72	150.68	150.86	150.83	150.66	150.66	149.34	149.71	150.37
150	Max	150.54	150.47	150.66	150.68	150.54	150.57	149.25	149.56	149.44
Average		150.65	150.61	150.77	150.61	150.61	150.61	149.30	149.62	150.30
	TN101	TN102	TN103	TN104	TN105	TN106	TN107	TN108	TN109	TN110
Min	150.25	150.40	150.40	150.73	150.41	150.80	150.55	150.65	149.40	150.75
Max	150.10	150.30	150.25	150.63	150.33	150.72	150.47	150.50	149.27	150.60
Average	150.18	150.35	150.32	150.69	150.37	150.75	150.51	150.57	149.38	150.69
	TN91	TN92	TN93	TN94	TN95	TN106	TN97	TN98	TN99	TN100
Min	151.05	150.70	150.59	150.34	150.87	150.71	150.73	149.42	150.77	150.06
Max	150.90	150.83	150.40	150.81	150.74	150.56	150.63	149.53	150.60	149.88
Average	150.96	150.61	150.50	150.60	150.80	150.62	150.68	149.37	150.68	149.98
	TN101	TN102	TN103	TN104	TN105	TN106	TN107	TN108	TN109	TN110
Min	149.78	149.65	149.81	150.14	150.71	150.90	150.21	150.82	149.21	151.85
Max	149.64	149.57	149.68	150.01	150.59	150.79	150.07	150.71	149.18	150.83
Average	149.68	149.61	149.74	150.08	150.65	150.83	150.15	150.76	149.16	150.89
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100
Min	150.94	150.28	150.68	150.74	150.26	150.29	150.35	150.18	149.27	149.72
Max	150.67	150.15	150.50	150.57	150.24	150.11	150.20	150.09	149.18	149.62
Average	150.83	150.22	150.59	150.65	150.31	150.22	150.18	150.14	149.22	149.67
	TN101	TN102	TN103	TN104	TN105	TN106				
Min	149.28	150.12	150.25	150.39	150.91	150.36				
Max	149.07	149.94	150.16	150.21	150.73	150.27				
Average	149.20	150.06	150.20	150.30	150.83	150.32				

Approved By: Bonchai

FM-113 108/20-05-57



Certificate No. T210717

Page 5 of 5

Calibration Report

Measurement Results

HOT BLOCK			Temperature Distribution		
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uncertainty (± °C)
	Min, Max	Average			
149.6	149.5, 149.7	149.6	150.37	0.30	0.87

The calibration result apply only the above calibrated item.

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

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

Approved By:

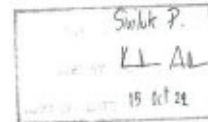
PM-UV-708-02 Rev 01 (23/01/63)



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-29021
Equipment UV/VIS Spectrophotometer
Model UV-1600
Manufacturer Shimadzu
Serial No. A11454908533CD
ID No. BSCC_END015
Date of receipt 15 October 2021
Date of calibration 15 October 2021
Date of issue 25 October 2021



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

Temperature (25.0 - 26.4) °C (On site)
Humidity (49.5 - 53.4) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Prep

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

Traceability Wavelength Accuracy is traceable to certificate No. 87839 and 87844
Photometric Accuracy is traceable to certificate No. 87845 and 87877
Stray Light is traceable to certificate No. 87825
The above certificate are traceable to SI unit through Bara Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0656)

Calibrated by Mr. Wanchana Jaritloy

Approved by

Mr. Kanchit Choochep
Technical Manager

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

PM-UV-708-02 Rev 01 (23/01/63)



Certificate of Calibration

Certificate No. BSCC-UV-29021

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
241.70	241.55	-0.15	0.18
334.02	333.80	-0.22	0.18
418.53	418.40	-0.13	0.18
572.99	572.85	-0.14	0.18
670.41	670.15	-0.26	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7174	0.7168	0.0006	0.0075
257	0.0000	-0.0001	-0.0001	0.0075
	0.6362	0.6377	0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2778	0.2803	0.0025	0.0075
350	0.0000	-0.0001	-0.0001	0.0075
	0.6202	0.6221	0.0019	0.0075

*CNR = Customer not request

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PM-UV-708-02 Rev 01 (23/01/63)



Certificate of Calibration

Certificate No. BSCC-UV-29021

Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.9631	0.9570	-0.0061	0.0042
	0.7390	0.7334	-0.0056	0.0042
	1.0863	1.0815	-0.0047	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5524	0.5469	-0.0055	0.0042
	0.7217	0.7166	-0.0051	0.0042
	1.0606	1.0570	-0.0036	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5018	0.4966	-0.0052	0.0042
	0.6867	0.6810	-0.0057	0.0042
	0.9775	0.9740	-0.0035	0.0042
545.1	0.0000	0.0000	0.0000	0.0042
	0.5147	0.5113	-0.0034	0.0042
	0.6743	0.6705	-0.0038	0.0042
	0.9609	0.9580	-0.0029	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5427	0.5384	-0.0043	0.0042
	0.7037	0.7001	-0.0036	0.0042
	1.0336	1.0323	-0.0013	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5208	0.5236	0.0028	0.0042
	0.8720	0.8685	-0.0035	0.0042
	0.9854	0.9847	-0.0007	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC) Wavelength (nm)	Transmission (%)	Absorbance (A)
200.01±0.1nm	200.31	0.0369	2.0274

The Stray light transmission reference is less than 1.0% and Stray light absorbance reference is greater than 2.00A
*Stray Light not NIS-ONSC Accredited.

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

End of Certificate

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

PM-UV-708-02 Rev 01 (23/01/63)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/1 PATTANAKARN ROAD SOI 19, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717 3099-21 FAX. 0-2718 8454



Cert.No.: 21CG1446
Page.: 1 of 2

Certificate of Calibration

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID. No. : BKK_EN0171
Manufacturer : Wittig
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.
Khwang Phatthanakan, Khet Suan Luang
Bangkok 10250 Thailand
Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 755 mmHg
Calibration Procedure : ASTM E 542 - 01
Calibrated by : Sa-nguankam Wongsa

REVIEW BY Smit P.
APPROVED BY KL AL
NEXT CAL. DATE 03/9/22

Approved by : [Signature]
Approved Signatory
() Pongthipha Tamayakul
() Malee Buksara
() Ponpan Paipin
() Srisuda Khamsa

Issue Date : 31 March 2021

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 0026589



Equipment : Burette
Received Date : 24 March 2021
Condition As-Received : Used Item
Calibration Date : 30 March 2021
Reference : 2103-1008DSC-5

Cert.No.: 21CG1446
Page.: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134206712	140RC007	21MM181	NIMT	02 Mar 2022
2) Thermo-Hygrograph	TH 803	09153022	140EC004	20H1434	NIST,NIMT	19 June 2021
3) Thermometer		1564592	140EC010	20I1191	NIMT	06 Oct 2021
- This certification is traceable to SI Unit.
- The certificate is valid only to the item calibrated on date and place of calibration.
- True value is converted to true volume at the standard temperature of 20 °C.

Calibration result:

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
50	50.0041	0.011	2.00

Remark mL = cm³

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

-050-

[Signature]

a 1048960



Metrological Center SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +666 9205 6951, +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T211009

Page 1 of 4

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., Khwang Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Laboratory
Date of Receipt : 6 May 2021
Calibrated By : Watcharapon Songthong (Technician)
Approved By : [Signature] / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 20 MAY 2021

REVIEW BY Smit P.
APPROVED BY KL AL
NEXT CAL. DATE 16/1/22

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 11705-02-64



Metrological Center SCI ECO Services Company Limited

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



Certificate No. T211009

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 18 May 2021
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in accordance to WI-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	8 January 2022
TC	TYPE T	TN171-TN180	T210009	8 January 2022
DATA LOGGER	34970A	T149	T210009	8 January 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 : 1 Hour
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By : [Signature]

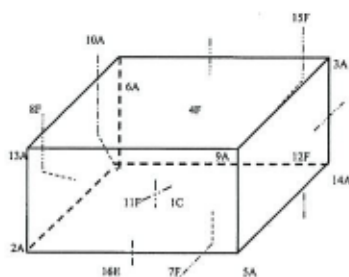
FM-L15 11705-05-63



Certificate No. T211009

Page 3 of 4

Calibration Report



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

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

Approved By:

PM-L15 J1705-05-63



Certificate No. T211009

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	3.23	3.38	3.23	3.41	3.36	3.52	3.51	3.11	3.29	3.50
	TN171	TN172	TN173	TN174	TN175	TN176				
	3.36	3.18	3.52	3.22	3.28	3.51				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
3.0	2.7	3.4	3.0	3.34	1.00	1.30	2.00

* The Accused 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:

PM-L15 J1705-05-63

Sartorius (Thailand) Co., Ltd.
121 Rama 9 Road, Hualayong, Hualayong, Bangkok 10310
Tel: +66 2643 8301-5 Fax: +66 2643 8307 e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

Model Number: **MSU2245-000-DA**
Description: **Analytical Balance**
Serial Number: **27405555 # BKK_EN0003**
Manufacturer: **Sartorius**

Certificate No.: **21BC10263**
Issued Date: **Monday, September 06, 2021**
Reference No.: **502052**
Page No.: **1 of 2**

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

Calibrated Place: **Lab Room**

Calibrated By: **Mr Chonchai Isathana**
Calibration Date: **Friday, September 03, 2021**

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

Metrological data:
Capacity: **220 g** Readability: **0.0001 g**
Ambients Conditions:
Temperature: **23.5 °C ± 5.0 °C**
Humidity: **59.1 % 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
MSU2245-000-DA	Sartorius weight set 1kg - 200g E2,MSU2245-000-DA	Sartorius	11804 D-4-10380-01-00	10-Sep-2021
MHB-3825D	Humidity/Balance/Temp. Control MHB-3825D	SPCC	KSPR2111809	31-Aug-2022

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.

ISO/IEC 17025-81-22 2018/2020 R2

Mr Chonchai Isathana (Technical Manager)

S
T
A
M
P



Sartorius (Thailand) Co., Ltd.
121 Rama 9 Road, Hualayong, Hualayong, Bangkok 10310
Tel: +66 2643 8301-5 Fax: +66 2643 8307 e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number: **MSU2245-000-DA**
Description: **Analytical Balance**
Serial Number: **27405555 # BKK_EN0003**
Manufacturer: **Sartorius**

Certificate No.: **21BC10263**
Issued Date: **Monday, September 06, 2021**
Reference No.: **502052**
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 readings under identical 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.			The off-center loading error is yielded by the difference between the reading 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	200.0001	Nominal value:	50	g
20 g	20.0001	200.0000	Tolerance	0.0004	g
Tolerance	0.0001 g	0.0001 g			
Nominal Value: (High Load)	200 g	200.0000			
200 g	200.0001	200.0000			
Tolerance	0.0001 g	0.0001 g			
Standard Deviation	0.00005	0.00005			

Uncertainty

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

Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
1	1.0000	1.0000	0.0000	0.00013
2	2.0000	2.0000	0.0000	0.00013
5	5.0000	5.0000	0.0000	0.00013
10	10.0000	10.0000	0.0000	0.00013
20	20.0000	20.0000	0.0000	0.00013
50	50.0001	50.0002	0.0001	0.00014
100	100.0001	100.0002	0.0001	0.00014
200	200.0001	200.0001	0.0000	0.00029

End of Report

ISO/IEC 17025-81-22 2018/2020 R2



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
334 PATTANAKARN ROAD, SUKHUMVIT 11, SUKHUMVIT, BANGKOK 10110
TEL: 0 2111 3000-27 FAX: 0 2111 3000-28



Cert. No.: 21TM2189
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UFE 500
Serial No. : G511.1574
ID No. : BKK_EN0007
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd.,
Khwang Phatthanasak, Khet Sun Luang,
Bangkok 10250 Thailand
Location : Oven Room
Received Order : 1 December 2021
Calibration Date : 1 December 2021
Ambient Temperature : (25 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khit Rutanaprapachai
Approved by :
() Pornthipha Tameyukul
() Maloo Butkova
() Sunit Injai
Issue Date : 7 December 2021

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 0032815



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2112-0002OC-1

Cert. No.: 21TM2189
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-0702 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	34970A	MY44060450	21LM4/1	06 Mar 2022

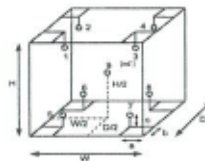
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate 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 = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.40 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	51	53
AC Supply (Volt)	221	222

Ref. Std. ID No. @ Calibration Point		
Position :	(104) °C	(121, 175, 180) °C
1	19-14RTD-01	19-14TC-01
2	19-14RTD-02	19-14TC-02
3	19-14RTD-03	19-14TC-03
4	19-14RTD-04	19-14TC-04
5	19-14RTD-05	19-14TC-05
6	19-14RTD-06	19-14TC-06
7	21-14RTD-07	19-14TC-07
8	19-14RTD-08	19-14TC-08
9 (ref.)	19-14RTD-09	19-14TC-09

a 1085618



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2112-0002OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 21TM2189
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
104.0	104.0	104.0	0.059	0.52	0.59	0.45	2
121.0	121.0	121.0	0.11	0.75	1.2	1.1	2
175.0	175.0	175.0	0.13	0.90	1.6	1.1	2
180.0	180.0	180.0	0.13	0.93	1.6	1.1	2

Measured Temperature (°C)									
Point (°C)	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	104.265	104.229	104.080	103.922	104.390	104.304	104.284	103.994	103.909
121.0	120.838	120.519	120.661	120.524	121.162	120.855	120.703	120.126	120.726
175.0	175.021	174.603	174.848	174.652	175.830	175.321	175.411	174.440	175.222
180.0	179.792	179.374	179.575	179.376	180.643	180.081	180.174	179.217	180.014

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 %.

-000-

a 1085617



Metrological Center

SCI ECO Services Company Limited

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

Saraburi Tel : +66 3627 3090 Fax : +66 3627 3100

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

Website : www.sci.co.th E-Mail : calibrate@sci.co.th



Certificate No. T220139

Page 1 of 3

Certificate of Calibration

Equipment : Liquid Bath (Water)

Manufacturer : MEMMERT

Model : WNB29

Serial No. : L611.0135

Customer Code : BKK_EN0148

ID No. : T6455A4

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

104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Phatthanasak,

Khet Sunn Luang, Bangkok 10250

Customer Location : ORGANIC PREPARATION LAB

Date of Receipt : 26 January 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : / Sujjar Nakkakred (Site Calibration Manager)

Date of Issue : 08 FEB 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.

TM-L14-117501-02-64

Certificate No. T220139

Page 2 of 3

Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 31 January 2022
Environment : Temperature : 22.4-23.9 °C
Line Voltage : 221.4-225.4 V
Relative Humidity : 55-65 %RH

Condition of this results of calibration :

- This equipment was calibrated by seven five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WS-T36 (based on ASTM E715-80) (Reciprocal 2001)
All data shown below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
- Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
RTD 100 OHM MD4 (CH1-CH5) T210115 2 February 2022
DATA LOGGER 34970A T47 T210115 2 February 2022
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 62+1)
- Condition of calibrated item : good
Equipment Description :
Time Constant 1 Hour - Minute At 60 °C
- Adjustment :
(X) without adjustment () after adjustment

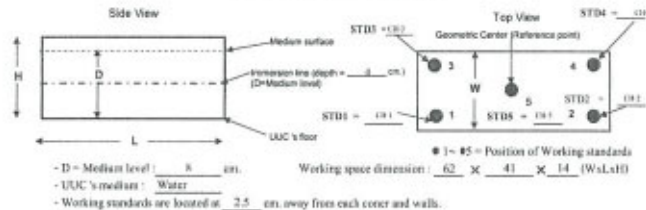
Approved By:

FM-15-117-15-05-63

Certificate No. T220139

Page 3 of 3

Calibration Report



Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-2	CH-3	CH-4	CH-5
10	59.95	60.04	60.12	60.01	59.99
85	85.17	84.81	85.34	84.78	84.93
95	95.46	95.14	95.81	95.85	95.28

Setting (°C)	Liquid Bath (Water)		Temperature Distribution			
	Reading (°C)		Stability	Uniformity	Uncertainty	Coverage
	Min, Max	Average	(% °C)	(% °C)	(% °C)	Factor A
61.0	60.9 - 61.1	61.0	0.10	0.19	0.25	2.00
86.0	85.9 - 86.1	86.0	0.12	0.19	0.32	2.06
95.0	94.9 - 95.1	95.0	0.14	0.31	0.38	2.11

* 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 normal distribution, providing a level of confidence of approximately 95 % .

Approved By:

FM-15-117-15-05-63

HACH COMPANY

C/O All Sci (Thailand) Limited, Building D Room No. 05 11, 3rd Floor, No. 73/4, Srinakharin Road, Pattanakarn, Suanluang, Bangkok
(Phone +66 (0)2 036-3529 Ext. 0) Fax +66(0)2 036-3573 www.hach.com

LABX 2102202

Test Report

Customer	ALS Laboratory Group (Thailand) Co., Ltd.	Manufacturer	HACH
Equipment	Chlorine Meter	Sensor Model	-
Controller Model	Pusher II C2	Sensor Serial No.	8104_LG0018
Controller Serial No.	13080225094	Period	1 Year
Date of test	20/09/2021	Humidity	60.0 %RH
Environment temperature	29.8 °C		

Results

Item	Characteristic	Before	After	Remark
1	Visual Inspect	Pass	Pass	
2	Power Supply (x 0.5 - 0.5 VDC)	6.0 VDC	6.0 VDC	
3	Display Check	Pass	Pass	
4	Keyboard Check	Pass	Pass	
5	Function System Program	Pass	Pass	

Warning and Error Checked

Item	Error	Before	After
6	Error test	None	None
		Appear	Appear

Check with Standard

Item	Characteristic	Before	After	Remark
7	Blank (0.00 mg/L)	0.00 mg/L	0.00 mg/L	
8	Standard CD No. 1 (0.22 ± 0.08 mg/L)	0.21 mg/L	0.20 mg/L	
9	Standard CD No. 2 (0.81 ± 0.10 mg/L)	0.91 mg/L	0.90 mg/L	
10	Standard CD No. 3 (1.50 ± 0.14 mg/L)	1.57 mg/L	1.57 mg/L	
11	Blank (0.00 mg/L)	0.00 mg/L	0.00 mg/L	
12	Standard CD No. 1 (0.22 ± 0.08 mg/L)	0.22 mg/L	0.22 mg/L	
13	Standard CD No. 2 (0.81 ± 0.10 mg/L)	0.80 mg/L	0.80 mg/L	
14	Standard CD No. 3 (1.50 ± 0.14 mg/L)	1.50 mg/L	1.50 mg/L	

REVIEW BY:
APPROVED BY:
NEXT CAL DATE: 20/09/22



HACH COMPANY

C/O All Sci (Thailand) Limited, Building D Room No. 05 11, 3rd Floor, No. 73/4, Srinakharin Road, Pattanakarn, Suanluang, Bangkok
(Phone +66 (0)2 036-3529 Ext. 0) Fax +66(0)2 036-3573 www.hach.com

LABX 2102202

Summary of checked

- ☒ The instrument can work normally and efficiently. (เครื่องมือสามารถทำงานได้ตามปกติและอย่างมีประสิทธิภาพ)
- ☐ The instrument can work but it's requiring to maintenance. (เครื่องมือสามารถทำงานได้แต่จำเป็นต้องบำรุงรักษา)
- ☐ The instrument could not work it's requiring to repair. (เครื่องมือไม่สามารถทำงานได้และจำเป็นต้องซ่อมแซม)

Remark

Standard Equipment List

Equipment	Equipment ID
Standard Chlorine DPD-CHLORINE LR	Lot No. A1018 Exp. date Feb-23
Standard Chlorine DPD-CHLORINE HR	Lot No. A1018 Exp. date Jan-23
Digital multi meter	SN 25805027 Due date Aug-22
Thermometer	SN 41415945 Due date Aug-22

Test By :

WILAIK S.
(Ms Wilaiak Sawangpue)
Service Engineer

Approved by :

(Mr. Saenun Sanyangskool)
Position : Assistant Service Division Manager



SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Srinthorn 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. : ACC22004
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178120
ID No. : BKK_FS0633

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 : 05 JANUARY 2022
Calibration Date : 14 JANUARY 2022
Date of Issue : 17 JANUARY 2022

Calibrated by : Nathakorn Pitsupaisan

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.

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22004
Job No. : VC65AC0041
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	MY52902742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05-0264	10-Feb-22
Digital Multimeter	33461A	MY53220070	EEL-BP_03-0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	I-15160725255-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774J	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V74406069	EF-0010-21	10-Feb-22

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. : ACC22004
Job No. : VC65AC0041
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	94.06	0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.3	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.19	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 Srinthorn 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. : ACC22004
Job No. : VC65AC0041
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00658242 / 157782 / 48097
ID No. : BKK_FS0099

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 JUNE 2021
Calibration Date : 09-10 JUNE 2021
Date of Issue : 11 JUNE 2021

Calibrated by : Nathakorn Pitsupaisan

Approved by :

T. Petchuraj
(Thanakul Petchuraj)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
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	EP-0912-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EP-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_03/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_04/0264	08-Feb-22
Digital Multimeter	33461A	MY53220116	EEL-BP_04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	02100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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.T.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
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

~ R.T.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	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	13.1
C-weight	18.9
Flat	24.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.3	0.3	± 1.5
1000	-0.1	0.0	0.0	± 1.0
8000	-1.6	-1.6	-1.6	± 5.0

QF-TS12-04-04-020664

~ R.T.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	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	0.0	±2.0
4000	0.0	0.1	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	94.1	0.1	± 0.3

QF-TS12-04-04-020664

~ R.T.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

QF-TS12-04-04-020664

T. R. L.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
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, T _b (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	-
Out	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	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. R. L.

Continuation of Calibration Certificate

Cert. No. : ACL21054
Job No. : VC64AC0043
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

T. R. L.

451-451/1 Sindhorn 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. : ACL21054
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00584983 / 175177 / 85722
ID No. : BKK_F50926

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 ± 5) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 06 JULY 2021
Calibration Date : 07-08 JULY 2021
Date of Issue : 13 JULY 2021

Calibrated by : Nuthakorn Pichapaisan

Approved by : T. R. L.
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
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 Acoustic chamber and Reference Standard Instruments.

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48917076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP, 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP, 05/0264	08-Feb-22
Digital Multimeter	33461A	MY53220116	EEL-BP, 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100134	1509-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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).

QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
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. Time 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

QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	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	13.6
C-weight	18.4
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.9	-0.8	-0.8	± 5.0

QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	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	0.0	±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

QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
Pages : 6 of 8

7. Level linearity on the reference level range

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

QF-TS12-04-04-029664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
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	134.1	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	128.0	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	136.0	-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

QF-TS12-04-04-029664

Continuation of Calibration Certificate

Cert. No. : ACL21065
Job No. : VC64AC0051
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

451-451/1 Sirinthorn Rd., Bangbunma, Bangkok 10700 THAILAND
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Cert. No. : ACL21149
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00658240 / 157780 / 48093
ID No.: BKX FS0097

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 : 08 NOVEMBER 2021
Calibration Date : 09-10 NOVEMBER 2021
Date of Issue : 12 NOVEMBER 2021

Calibrated by : Nathakorn Pitsuraisan

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

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QF-TS12-04-04-029664

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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-0012-21	10-Feb-22
Waveform Generator	33511B	MY53202742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL_BP_06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	04-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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-TS12-04-04-028664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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-TS12-04-04-028664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
19.4

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

Frequency Weighting	Measured value (dB)
A-weight	13.1
C-weight	18.8
Flat	24.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.4	0.3	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-0.7	-0.6	-0.6	±2.0

QF-TS12-04-04-028664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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-TS12-04-04-028664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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	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	30.1	0.1	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.2	0.2	±1.1

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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, Lepeak (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	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±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. : ACL21149
Job No. : VC65AC0015
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

451-451/1 Srinthorn Rd., Bangbunru, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2435-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22003
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No.: 34178119
ID No.: BCK, F80632

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 : 05 JANUARY 2022
Calibration Date : 14 JANUARY 2022
Date of Issue : 17 JANUARY 2022

Calibrated by : Nithakorn Pivattanas

Approved by : T. Petch
(Thanakul Petchurai)

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QF-TS12-04-04-020664

T. Petch

QF-TS12-04-04-020664

Cert. No. : ACC22063
Job No. : VC65AC0041
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-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05-0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03-0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1006-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-21	10-Feb-22

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. : ACC22063
Job No. : VC65AC0041
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	93.94	-0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.0	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.73	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ in 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 LABORATORY451-451/1 Srinthorn Rd, Banghumi, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2435-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL21148
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier NH-24
Serial No.: 00658239 / 145496 / 48094
ID No.: BKK_FS0096

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUANG 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 : 08 NOVEMBER 2021
Calibration Date : 09-10 NOVEMBER 2021
Date of Issue : 12 NOVEMBER 2021

Calibrated by : Nuthakorn Pisatpoisan

Approved by :

T. Petchum
(Thanakul Petchum)

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QF-TS12-04-04-020664

Cert. No. : ACL21148
Job No. : VC65AC0015
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 A-weighting and Reference Standard Instruments.

For tests results of each item were made by observation of each instrument's 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-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05-0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03-0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL-BP_06-0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1006-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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. : ACL21148
Job No. : VC65AC0015
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	✓	-	0.4	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	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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T. P. K.

Continuation of Calibration Certificate

Cert. No. : ACL21148
Job No. : VC65AC0015
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.1

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

Frequency Weighting	Measured value (dB)
A-weight	16.7
C-weight	22.4
Flat	28.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.6	0.6	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.3	-0.3	-0.2	±5.0

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T. P. K.

Continuation of Calibration Certificate

Cert. No. : ACL21148
Job No. : VC65AC0015
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	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Lsq	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

Continuation of Calibration Certificate

Cert. No. : ACL21148
Job No. : VC65AC0015
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.1	0.1	±1.1
29.0	30.1	0.1	±1.1
24.0	29.1	0.1	±1.1
19.0	28.3	0.3	±1.1
14.0	27.3	0.3	±1.1
9.0	26.5	0.5	±1.1
4.0	25.7	0.7	±1.1

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T. P. K.

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T. P. K.

Cert. No. : ACL21148
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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)
Amo	94.0	94.1	0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	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	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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petch

Cert. No. : ACL21148
Job No. : VC65AC0015
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.4	89.7	0.3	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Srinthorn Rd., Bangbunru, Bangkok 10700 THAILAND
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Cert. No. : ACL21123
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00572669 / 157781 / 48096
ID No. : BKK_F50924

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KJHWAENG 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 : 29 SEPTEMBER 2021
Calibration Date : 12-14 OCTOBER 2021
Date of Issue : 15 OCTOBER 2021

Calibrated by : Nathakorn Pisarpaisan

Approved by :

T. Petch
(Thanakul Petchurni)

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QF-TS12-04-04-020664

Cert. No. : ACL21123
Job No. : VC64AC0071
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 test results of each item were made by observation of each Instruments display and also with SLMs display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EE-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EE-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05-0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03-0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL-BP_06-0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	LS00-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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. Petch

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.2

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.2

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

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	18.7
Flat	24.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.0	-0.9	-0.9	±5.0

QF-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	-0.1	±1.0
2000	-0.1	0.0	0.0	±2.0
4000	-0.1	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
1 eq	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. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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	±1.3
136.0	136.0	0.0	±1.3
135.0	135.1	0.1	±1.3
134.0	134.1	0.1	±1.3
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
29.0	29.0	0.0	±1.1
24.0	24.1	0.1	±1.1
21.0	21.1	0.1	±1.1
20.0	20.1	0.1	±1.1
25.0	25.2	0.2	±1.1

QF-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	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, Lepeak (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

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.8	89.5	-0.3	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sithiporn Rd., Bangburua, Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:center@sithiporn.com http://www.sithiporn.comCert. No. : ACL21146
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier NH-24
Serial No.: 00572566 / 170403 / 72904
ID No.: BKK_FS0875

Condition As Found : GOOD

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

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

Received Date : 01 NOVEMBER 2021
Calibration Date : 02-04 NOVEMBER 2021
Date of Issue : 05 NOVEMBER 2021

Calibrated by :

Nalinakorn Petchur

Approved by :

T. Petchur
(Thanakul Petchur)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
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.	Exp. Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-IP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-IP_03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL-IP_06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	14-Feb-22

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. : ACL21146
Job No. : VC65AC0011
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

QE-TS12-04-04-020664

T. Ratan.

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	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	16.3
Flat	21.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.5	0.5	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.8	-1.8	-1.7	±5.0

QE-TS12-04-04-020664

T. Ratan.

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

QE-TS12-04-04-020664

T. Ratan.

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±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

QE-TS12-04-04-020664

T. Ratan.

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
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, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
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	-
Osc	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

QF-TS12-04-04-020664

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL21146
Job No. : VC65AC0011
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	89.7	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. Petchurai

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CALIBRATION LABORATORY

451/451/1 Sirinthorn Rd., Banghumsri, Bangkok 10700 THAILAND
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Cert. No. : ACL21122
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00572552 / 170384 / 72890
ID No. : BKK-FS0877

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3.0) °C
Pressure : (101.3 ± 3.0) kPa
Relative Humidity : (50.0 ± 20.0) %

Received Date : 29 SEPTEMBER 2021
Calibration Date : 12-14 OCTOBER 2021
Date of Issue : 15 OCTOBER 2021

Calibrated by : Nakhorn Pongpaoon

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
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 item were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53229104	EEL-BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0264	08-Feb-22
Digital Multimeter	8846A	1907025	EEL-BP_06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mac-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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. : ACL21122
Job No. : VC64AC0071
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

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	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	11.6
C-weight	17.6
Flat	23.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.3	±1.5
1000	0.0	-0.1	-0.1	±1.0
8000	-1.5	-1.5	-1.4	±5.0

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.3	±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
1 eq	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SI M Display at initial (dB)	SI M 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. : ACL21122
Job No. : VC64AC0071
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
128.0	128.0	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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
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, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	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, Lepeak (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	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QT-TS12-04-04-020664

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
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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	S.L.M Display at initial (dB)	S.L.M Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.5

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

QT-TS12-04-04-020664

T. Petchum

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

45/1-45/1-1/1 Srinthom Rd., Banglumru, Bangkok 10700 THAILAND
Tel: 2435-8800 Fax: 2433-1679 e-mail: calcenter@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22004
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178120
ID No. : BKK_P0633

Condition As Found : GOOD

Customer : A.S.I. LABORATORY GROUP (THAILAND) CO., LTD.
104 PIATTHANAKAN 40, PIATTHANAKAN ROAD,
KHWAENG PIATTHANAKAN, 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 : 05 JANUARY 2022
Calibration Date : 14 JANUARY 2022
Date of Issue : 17 JANUARY 2022

Calibrated by : Nattakorn Pichumai

Approved by : T. Petchum
(Thanakul Petchum)

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QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC22004
Job No. : VC65AC0041
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-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_05-0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_03-0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1509-07774E	09-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42K A1	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B0069	EF-0010-21	10-Feb-22

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).

QT-TS12-04-04-020664

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACC22064
Job No. : VC65AC0041
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	94.06	0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.3	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.19	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

QE-TS12-04-04-020664

451-451/1 Srinthorn Rd, Banghruem, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2431-1679 e-mail:cal-cert@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL21123
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 06572609 / 157781 / 48096
ID No. : BKE_T80924

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 29 SEPTEMBER 2021
Calibration Date : 12-14 OCTOBER 2021
Date of Issue : 15 OCTOBER 2021

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>T. Petchum</i>
NEXT CAL DATE	12/10/22

Calibrated by : Nathakorn Pitsupaisan

Approved by : *T. Petchum*
(Thunakul Petchum)

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Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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	EE-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EE-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_050264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_050264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL_BP_060264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977908	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAL	34580495	AA-3003-21	16-Feb-22

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).

QE-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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

QE-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.2

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

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	18.7
Flat	24.6

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	0.5	0.5	0.5	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.0	-0.9	-0.9	±5.0

QF-TS12-04-04-020664

T. R. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	-0.1	±1.0
2000	-0.1	0.0	0.0	±2.0
4000	-0.1	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
1 eq	94.0	0.0	±0.1

6. Long-term stability

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

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T. R. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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	30.0	0.0	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.2	0.2	±1.1

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T. R. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL21123
Job No. : VC64AC0071
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, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	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	106.0	107.9	-0.1	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	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

T. R. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0871
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.8	89.5	-0.3	+1.5

12. High level stability

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

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

End of Calibration Certificate

451-451/1 Srinthom Rd, Bangbunru, Bangkok 10700 THAILAND.
Tel: 0-2435-8800 Fax: 0-2431-1679 e-mail: cal-center@jithiporn.com Http://www.sithiporn.com



Cert. No. : ACL21122
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00572552 / 170384 / 72890
ID No. : BKK_F50877

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 ± 3.1) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 2.0) %
Received Date : 29 SEPTEMBER 2021
Calibration Date : 12-14 OCTOBER 2021
Date of Issue : 15 OCTOBER 2021

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>T. Petchum</i>
NEXT CAL. DATE	12/10/22

Calibrated by : Nathakorn Pongpisan

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

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Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0871
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2012) 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	35210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_03/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0264	08-Feb-22
Digital Multimeter	8946A	1997025	EEL_BP_06/0264	05-Feb-22
Programmable Attenuator	MA7-1070	62100114	1508-0774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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).

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0871
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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QF-TS12-04-04-020664

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	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	11.6
C-weight	17.6
Flat	23.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.3	±1.5
1000	0.0	-0.1	-0.1	±1.0
8000	-1.5	-1.5	-1.4	±5.0

QF-TS12-04-04-020664

T. R. R.

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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	SIM Display at initial (dB)	SIM 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. R. R.

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 6 of 8

7. Level linearity on the reference level range

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

QF-TS12-04-04-020664

T. R. R.

Cert. No. : ACL21122
Job No. : VC64AC0071
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, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.1	0.1	±3.0
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	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	-
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. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL21122
Job No. : VC64AC0071
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	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	±0.3

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 Sirithorn 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. : ACL21055
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00658243 / 157783 / 48098
ID No. : BKK_F50100

Condition As Found : GOOD

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

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

Received Date : 07 JUNE 2021
Calibration Date : 09-10 JUNE 2021
Date of Issue : 11 JUNE 2021

REVIEW BY	<i>Thakorn P.</i>
APPROVED BY	<i>T. Petchurai</i>
NEXT CAL. DATE	9/6/22

Calibrated by : Narakorn Pitsupaisan

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

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0043
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 item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP. 03/0264	08-Feb-22
Digital Multimeter	33461A	MY53220116	EEL-BP. 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1509-077748	08-Mar-22
Condenser Microphone	4180	2977960	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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. : ACL21055
Job No. : VC64AC0043
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

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.9

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

Frequency Weighting	Measured value (dB)
A-weight	13.5
C-weight	19.6
Flat	25.4

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 64 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.1	± 1.5
1060	0.0	0.0	0.0	± 1.0
8060	-0.2	-0.1	-0.2	±5.0

QF-TS12-04-04-020664

T. P. S.

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0043
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	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
Loq	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. P. S.

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0043
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	26.9	-0.1	± 1.1
26.0	25.8	-0.2	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. P. S.

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0043
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	-
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	133.0	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

T. P. S.

Continuation of Calibration Certificate

Cert. No. : ACL21055
Job No. : VC64AC0943
Pages : 8 of 8

11. Overload Indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	89.5	-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



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Cert. No. : ACL21149
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 0065K240 / 157780 / 48095
ID No. : BKK_FS0097

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUANG 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 : 08 NOVEMBER 2021
Calibration Date : 09-10 NOVEMBER 2021
Date of Issue : 12 NOVEMBER 2021

Calibrated by : Nathakorn Pitsupaisan

Approved by :

T. Petchum
(Thanakul Petchum)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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 SLMs display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_050264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_030264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL_BP_060264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07734E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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).

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
19.4

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

Frequency Weighting	Measured value (dB)
A - weight	13.1
C - weight	18.8
Flat	24.3

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)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.4	0.3	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.7	-0.6	-0.6	± 5.0

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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	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	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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	136.2	-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	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

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Continuation of Calibration Certificate

Cert. No. : ACL21149
Job No. : VC65AC0015
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-TS12-04-04-00864



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CERTIFICATE OF CALIBRATION

Certificate No. : CL-012-05
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 13024797
ID No: BKH_F50042

Customer
Name: A/S laboratory group (thailand) Co. Ltd.
Address: 104 Phatthanasak 40, Phatthanasak Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok, 10250 Thailand

Received date: 10 JAN 2022
Calibration date: 14 FEB 2022
Issue date: 17 FEB 2022

Reference Used During Calibration
1. Standard Temperature Probe Model: STS 10C A900, Serial No: 667682 09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DTI 1000-A MK II, Serial No: 673907 00591 Due date: 04 June 2022

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 0036 21, Certificate number: ER-0032 21

REVIEW BY	<i>[Signature]</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	14 / 2 / 23

Calibrated by
☐ Mr. Sasiwat Thairasat
☒ Miss Gattah Wutwattakul



Approved Signatory: *[Signature]*
Mr. Parinya Boonchansen
Calibration Department Manager

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Certificate No. : CL-012-05
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: 13035038.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.055	20.0	0.1	0.099
30	25.037	25.0	0.0	0.099
30	30.019	30.0	0.0	0.099
30	35.006	35.0	0.0	0.099
30	40.002	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 13033291.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.053	20.0	0.1	0.099
70	24.990	24.7	0.3	0.099
70	29.917	29.6	0.4	0.099
70	34.873	34.4	0.5	0.099
70	39.864	39.4	0.5	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 13042466.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.053	20.1	0.0	0.099
110	25.035	25.1	0.1	0.099
110	30.026	30.1	0.1	0.099
110	35.020	35.0	0.0	0.099
110	40.009	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 ★



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CERTIFICATE OF CALIBRATION

Certificate No. : CL-001-64
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 15035016
ID No: BKH_F50076

Customer
Name: A/S laboratory group (thailand) Co. Ltd.
Address: 104 Phatthanasak 40, Phatthanasak Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok, 10250 Thailand

Received date: 30 OCT 2021
Calibration date: 2 NOV 2021
Issue date: 3 NOV 2021

Reference Used During Calibration
1. Standard Temperature Probe Model: STS 10C A900, Serial No: 667682 09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DTI 1000-A MK II, Serial No: 671407 00501 Due date: 04 June 2022

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 0036 21, Certificate number: ER-0032 21

REVIEW BY	<i>[Signature]</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	2 / 11 / 22

Calibrated by
☐ Mr. Sasiwat Thairasat
☒ Miss Gattah Wutwattakul



Approved Signatory: *[Signature]*
Mr. Parinya Boonchansen
Technical Support and Calibration 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: 20030504.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.062	20.1	0.0	0.099
30	25.047	25.1	0.1	0.099
30	30.036	30.1	0.1	0.099
30	35.030	35.1	0.1	0.099
30	40.023	40.1	0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 16009383.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.053	20.2	0.1	0.099
70	24.855	24.9	0.0	0.099
70	29.818	29.7	-0.1	0.099
70	34.757	34.6	-0.2	0.099
70	39.723	39.5	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20008276.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.062	20.1	0.0	0.099
110	25.047	25.1	0.1	0.099
110	30.036	30.1	0.1	0.099
110	35.031	35.1	0.1	0.099
110	40.023	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 ★



ภาคผนวก จ

สำเนาใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

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[illegible]

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๓๓๖) นางสาวกัญญา นาม

พระโอรสองค์ที่ ๑	๒-๒๐๔-๑-๑
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(นายศิราช จันทน์เกิด)
 อดีตนายก อบจ. น่าน
 ผู้เข้ารับการสอบได้ตำแหน่ง อบจ. น่าน

— 3 —

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 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๘๔
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๘๕
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 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๘๙
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 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๒
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๓
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๔
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๕
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๖
 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๐๙๗
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 พระปิณฑกะที่ ๖ ๒๐๘-๖-๑๒๑๐๐

๗๒๙๒
(นายศิริ จันทน์วิเศษ)
อธิบดีกรมการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
ผู้อำนวยการสำนักงานคณะกรรมการกำกับ
และส่งเสริมการประกอบธุรกิจพลังงาน

เอกสารแนบท้ายหนังสือรับทราบข้อหาฐานกระทำความผิดอาญาเป็นการฉ้อโกง
บริษัท เอลเดอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๓-๒๐๔๘
ที่ ออก ๐๓๐๐(๔) ๐๐๒๕ ลงวันที่ ๒๔ มกราคม ๒๕๖๔

ขอทำนุบำรุงศิลปวัฒนธรรมที่ได้รับเกียรติและเงินจากกรมโบราณคดี ๓๖๕ บาท

ប្រាំបី ទំព័រ 59 តាមការ

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

(นางวิภาดา จิตกรกุลวิไล)
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และภาคใต้ของประเทศไทย

19 Copper.

ลำดับที่	สารเคมี	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁶⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽⁶⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽¹⁾ 2) Iodometric Method ⁽¹⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
37	Hexavalent Chromium	Filtration, Colorimetric Method ⁽¹⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁶⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ⁽¹⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁶⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾

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44 Methomyl...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽¹⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽¹⁾ 2) Soxhlet Extraction Method ⁽¹⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁶⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁶⁾
49	pH	Electrometric Method ⁽¹⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽¹⁾ 2) Distillation, Direct Photometric Method ⁽¹⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
52	Sulfide	Iodometric Method ⁽¹⁾
53	Temperature	Laboratory and Field Methods ⁽¹⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽¹⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽¹⁾
56	Total Suspended Solids	Dried at 103-105 °C ⁽¹⁾
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽¹⁾
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽¹⁾

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ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾

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3 Aldrin...

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

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18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
22	Butyl Benzyl Phthalate	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾

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34 Chromium (II)...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
34	Chromium (II)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁶⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

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51 cis-1,2-Dichloroethylene...

ลำดับที่	สารเคมี	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	2,6-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⁾

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68 Fluorene...

ลำดับที่	สารเคมี	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 ⁽⁶⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁶⁾
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁶⁾

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84 Methanol...

ลำดับที่	สารเคมี	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 ⁽⁶⁾
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⁾

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97 Pentachlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
98	pH	Electrometric Method ⁽¹⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
109	TPH (C ₉ -C ₁₀)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
110	TPH (C ₁₀ -C ₁₅)	Solvent Extraction, Gas Chromatographic Method ^(2,11)
111	TPH (C ₁₅ -C ₃₀)	Solvent Extraction, Gas Chromatographic Method ^(2,11)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾

วิมล
(นางสาววิมล อัครกุลกิจ)

114 1,1,2-Trichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽¹⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽¹⁾

ฉัตรกมล (ปิ่นทอง) จำนวน 16 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽¹⁾

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3 Carbon Monoxide...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ⁽¹⁾ 2) Non-Dispersive Infrared Method ⁽¹⁾ 3) Instrumental Analyzer Method ⁽¹⁾
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ⁽¹⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽¹⁾
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ⁽¹⁾
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ⁽¹⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽¹⁾
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽¹⁾
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
11	Opacity	Ringelmann's Method ⁽¹⁾
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽¹⁾ 2) Chemiluminescence Method ⁽¹⁾ 3) Instrumental Analyzer Method ⁽¹⁾
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽¹⁾ 2) UV Fluorescence Method ⁽¹⁾ 3) Instrumental Analyzer Method ⁽¹⁾
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽¹⁾
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽¹⁾
16	Xylene	Absorption Sampling, Gas Chromatographic Method ⁽¹⁾

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ฉัตรกมล...

ฉัตรกมล (ปิ่นทอง) จำนวน 35 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,12) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1,12) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1,12)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,14) 3) Digestion, Inductively Coupled Plasma Method ^(1,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,16)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,14) 3) Digestion, Inductively Coupled Plasma Method ^(1,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,16)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,14) 3) Digestion, Inductively Coupled Plasma Method ^(1,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,16)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,14) 3) Digestion, Inductively Coupled Plasma Method ^(1,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,16)

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6 Cadmium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.13) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.14)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.19) 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 ^(1A.15.17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1A.14.17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7A.13.17) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7A.14.17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1A.17) 2) Alkaline Digestion, Colorimetric Method ^(10.17)

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11 Cobalt...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.13) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.14)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.19) 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 ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
14	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
15	DOE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20)

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2) Soxhlet...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.19) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1A.18)

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2) Waste Extraction...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1A.18) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1A.20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1A.1) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1A.18) 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1A.20)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1A.20) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(10.23)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.19) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1A.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1A.19) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)

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27 Polychlorinated...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
27	Polychlorinated biphenyls (PCBs) - 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',4',6'-Pentachlorobiphenyl - 2,2',3,4,5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,2,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1,2,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)

28 Pentachlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,2,30) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1,2,31) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
29	pH	Electrometric Method ^(29,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,1,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,1,18) 3) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,1,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,1,16)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,1,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,1,18) 3) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,2,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1,2,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,1,18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,1,18) 3) Digestion, Inductively Coupled Plasma Method ^(7,1,18)

4) Digestion...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,1,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,1,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)

เพิ่ม จำนวน 125 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,2,24)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^(23,31) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^(1,2,25) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)

9 Benz(a)anthracene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,2,24)
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
14	Benzofluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
15	Benzofluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,2,24)
20	Bromofom	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,2,24)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(23,24)
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,1,18) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,1,18)
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,2,24)

26 Carbon tetrachloride...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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 ^(7,14)
34	Chromium (II)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,14,17) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,14,17)
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 ^(24,27,28)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(14,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)

Signature
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40 DOE...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
40	DOE	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
41	DOT	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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)

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57 Dieldrin...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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 ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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 ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)

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71 Hexachlorobenzene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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 ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Method ^(13,22) 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 ^(7,14)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁶⁾

Signature
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2) Thermal...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽¹⁾⁽⁶⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁾⁽⁶⁾
85	Methoxychlor	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
86	Methyl Bromide	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹⁾⁽⁵⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁾⁽⁶⁾
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾

วิภา
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- Aroclor 1242..

ลำดับที่	สารเคมี	วิธีวิเคราะห์
	- 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 - 2,3,4,6-Pentachlorobiphenyl - 2,2,3,4,5'-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',5,6-Nonachlorobiphenyl	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾

วิภา
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101 Selenium..

ลำดับที่	สารเคมี	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹⁾⁽⁵⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁾⁽⁶⁾
102	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹⁾⁽⁵⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁾⁽⁶⁾
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾
108	TPH (C ₉ -C ₆)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
109	TPH (C ₈ -C ₁₀)	1) Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽²⁾⁽³⁾⁽¹⁾
110	TPH (C ₁₁ -C ₃₅)	1) Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾⁽⁶⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽²⁾⁽³⁾⁽¹⁾
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾⁽⁶⁾
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾⁽³⁾⁽¹⁾

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116 2,4,6-Trichlorophenol..

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


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
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กรมโรงงานอุตสาหกรรม

ศูนย์ปฏิบัติการด้านสิ่งแวดล้อมและพิษภัยของโรงงานอุตสาหกรรม กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๕๔๔ ๔๔๔๔



ที่ กอ.รณ.๑๖/๒๕๖๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๒ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพมหานคร ๑๐๕๐๐

๒๕ มิถุนายน ๒๕๖๕

เรื่อง จ้างทะเบียนเพื่อปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้ตรวจการ บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียนเพื่ออนุญาตให้ใช้เครื่องมือทดสอบ และขอใบสารมลพิษของเพื่อปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๕ เมษายน ๒๕๖๕

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือขึ้นทะเบียนเพื่อปฏิบัติการวิเคราะห์เอกชน บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ ฉบับ

ตามที่หนังสือที่อ้างถึง บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียนเพื่อปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลเพื่อปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ได้รับแจ้ง บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขึ้นทะเบียนเพื่อปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ๖-๒๕๖๐ สถานที่ตั้งเลขที่ ๖๒๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอบางบาล จังหวัดพระนครศรีอยุธยา โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลเพื่อปฏิบัติการวิเคราะห์

- | | |
|------------------------|------------------------------|
| ๑) นายเศรษฐ ช้างงาม | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๒) นายวิวัฒน์ บริรักษ์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๓) นายสุพรรณ สอนะดี | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | |
|------------------------------|------------------------------|
| ๑) นางสาวณัฐพร บรรจงกิจ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๒) นายพรณัฐ สิตา | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๓) นางสาวณัฐพร กุลสุริวงศ์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๔) นายพิทยา ทองแดง | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๕) นางพรชิตา สุขเกษ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๖) ว่าที่ ร.ต.รณชัย ม่วงงาม | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๗) นายวรวิทย์ พิทยา | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๘) นายศักดิ์เนตร ธีรวิทย์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๙) นายสุรศักดิ์ สอนะดี | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๑๐) นางสาวพรพรรณ กุลสุริวงศ์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๑๑) นายสุภากร แก้วแก้ว | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
| ๑๒) นายสุวิทย์วงศ์ โชติรัตน์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |

๑๑) นายวิวัฒน์...

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| ๑๓) นายวิวัฒน์ โชติรัตน์ | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |
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| ๕๐) นายสุรศักดิ์ สอนะดี | ทะเบียนเลขที่ ๖-๒๕๖๐-๙-๒๕๖๐๖ |

ค. รองผู้อำนวยการที่ได้รับขึ้นทะเบียนไว้วิเคราะห์ในน้ำดื่ม จำนวน ๑๔ รายการ
จากภาคพื้น (ป่องกระป๋อง) จำนวน ๘ รายการ และน้ำดื่ม จำนวน ๖ รายการ รวมทั้งสิ้นจำนวน ๒๐ รายการ
ตามที่ส่งมาด้วย

หนังสือฉบับนี้จัดทำขึ้นเพื่อเป็นเอกสารประกอบการพิจารณาขอรับใบอนุญาตประกอบกิจการโรงงานอุตสาหกรรมตามพระราชบัญญัติโรงงาน พ.ศ. ๒๕๖๑ และพระราชบัญญัติการประกอบกิจการโรงงาน พ.ศ. ๒๕๖๒

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางสาววิภาดา สัมฤทธิ์เดช)

ผู้อำนวยการสำนักงานสิ่งแวดล้อมภาคที่ ๑๓

๒๕ มิ.ย. ๒๕๖๕

กองสิ่งแวดล้อมและสุขภาพ
ศูนย์วิจัยและสิ่งแวดล้อมศึกษา
โทร. ๐ ๔๘๐๕ ๙๖๕๕-๖
ไปรษณีย์อิเล็กทรอนิกส์ envstudy@mail.go.th


เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนโรงงานอุตสาหกรรมตามพระราชบัญญัติโรงงาน พ.ศ. ๒๕๖๑ และพระราชบัญญัติการประกอบกิจการโรงงาน พ.ศ. ๒๕๖๒
ที่อก ๐๓๐๐(๑)/ ๒๕๖๕
๒๕ มิ.ย. ๒๕๖๕

ขอแนบเอกสารแนบท้ายที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
แนบท้าย จำนวน ๑๔ รายการ

ลำดับที่	สารเคมี	วิธีการตรวจ
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 ^[2]
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]

เอกสารแนบ (โปรดขยาย) จำนวน 7 รายการ

ลำดับที่	สารเคมี	วิธีการตรวจ
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[2] 2) Instrumental Analyzer Method ^[2]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[2]
3	Opacity	Ringelmann's Method ^[2]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[2] 2) Instrumental Analyzer Method ^[2]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[2] 2) Instrumental Analyzer Method ^[2]


(นางสาววิภาดา สัมฤทธิ์เดช)

ผู้อำนวยการ
ศูนย์วิจัยและสิ่งแวดล้อมศึกษา
Sulfuric Acid...


ลำดับที่	สารเคมี	วิธีการตรวจ
6	Sulfuric Acid	Isokinetic Sampling, Barium - Thorin Titrimetric Method ^[2]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[2]

แนบท้าย จำนวน 3 รายการ

ลำดับที่	สารเคมี	วิธีการตรวจ
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

เอกสารอ้างอิง

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(นางสาววิภาดา สัมฤทธิ์เดช)

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