

ภาคผนวก ง

---

ใบรับรองการสอบเทียบเครื่องมือ









## EMISSION TEST RESULT

Client		Global Power Systems PCL	Run #		3
Date		18 Aug 24	Location		HRSO #2
Start Time		13:42	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Finish Time		14:02
NO <sub>x</sub> Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO/CO <sub>2</sub> Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
13:42	14.70	13.07	8.05	—	1.28	
13:43	14.70	13.06	8.05	—	1.27	
13:44	14.69	13.05	8.04	—	1.26	
13:45	14.68	13.04	8.03	—	1.25	
13:46	14.67	13.03	8.02	—	1.24	
13:47	14.66	13.02	8.01	—	1.23	
13:48	14.65	13.01	8.00	—	1.22	
13:49	14.64	13.00	7.99	—	1.21	
13:50	14.63	12.99	7.98	—	1.20	
13:51	14.62	12.98	7.97	—	1.19	
13:52	14.61	12.97	7.96	—	1.18	
13:53	14.60	12.96	7.95	—	1.17	
13:54	14.59	12.95	7.94	—	1.16	
13:55	14.58	12.94	7.93	—	1.15	
13:56	14.57	12.93	7.92	—	1.14	
13:57	14.56	12.92	7.91	—	1.13	
13:58	14.55	12.91	7.90	—	1.12	
13:59	14.54	12.90	7.89	—	1.11	
14:00	14.53	12.89	7.88	—	1.10	
14:01	14.52	12.88	7.87	—	1.09	
14:02	14.51	12.87	7.86	—	1.08	
Average	14.68	13.01	8.04	—	1.12	

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## ANALYZER CALIBRATION DATA

Client		Global Power Systems PCL	Location		HRSO #2
Date		20 Aug 24	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
NO <sub>x</sub> Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client		Global Power Systems PCL	Location		HRSO #2
Date		20 Aug 24	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
NO <sub>x</sub> Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Initial Values	Final Values	Drift (% of Span)
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01

Initial Values	Final Values	Drift (% of Span)
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01

Initial Values	Final Values	Drift (% of Span)
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01
NO <sub>2</sub> Gas	9.01	0.01

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## EMISSION TEST RESULT

Client		Global Power Systems PCL	Run #		1
Date		20 Aug 24	Location		HRSO #1
Start Time		10:30	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO/CO <sub>2</sub> Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
10:30	14.70	13.07	8.05	—	1.28	
10:31	14.70	13.06	8.05	—	1.27	
10:32	14.69	13.05	8.04	—	1.26	
10:33	14.68	13.04	8.03	—	1.25	
10:34	14.67	13.03	8.02	—	1.24	
10:35	14.66	13.02	8.01	—	1.23	
10:36	14.65	13.01	8.00	—	1.22	
10:37	14.64	13.00	7.99	—	1.21	
10:38	14.63	12.99	7.98	—	1.20	
10:39	14.62	12.98	7.97	—	1.19	
10:40	14.61	12.97	7.96	—	1.18	
10:41	14.60	12.96	7.95	—	1.17	
10:42	14.59	12.95	7.94	—	1.16	
10:43	14.58	12.94	7.93	—	1.15	
10:44	14.57	12.93	7.92	—	1.14	
10:45	14.56	12.92	7.91	—	1.13	
10:46	14.55	12.91	7.90	—	1.12	
10:47	14.54	12.90	7.89	—	1.11	
10:48	14.53	12.89	7.88	—	1.10	
10:49	14.52	12.88	7.87	—	1.09	
10:50	14.51	12.87	7.86	—	1.08	
Average	14.68	13.01	8.04	—	1.12	

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## EMISSION TEST RESULT

Client		Global Power Systems PCL	Run #		2
Date		20 Aug 24	Location		HRSO #1
Start Time		10:31	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO/CO <sub>2</sub> Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
10:31	14.70	13.07	8.05	—	1.28	
10:32	14.70	13.06	8.05	—	1.27	
10:33	14.69	13.05	8.04	—	1.26	
10:34	14.68	13.04	8.03	—	1.25	
10:35	14.67	13.03	8.02	—	1.24	
10:36	14.66	13.02	8.01	—	1.23	
10:37	14.65	13.01	8.00	—	1.22	
10:38	14.64	13.00	7.99	—	1.21	
10:39	14.63	12.99	7.98	—	1.20	
10:40	14.62	12.98	7.97	—	1.19	
10:41	14.61	12.97	7.96	—	1.18	
10:42	14.60	12.96	7.95	—	1.17	
10:43	14.59	12.95	7.94	—	1.16	
10:44	14.58	12.94	7.93	—	1.15	
10:45	14.57	12.93	7.92	—	1.14	
10:46	14.56	12.92	7.91	—	1.13	
10:47	14.55	12.91	7.90	—	1.12	
10:48	14.54	12.90	7.89	—	1.11	
10:49	14.53	12.89	7.88	—	1.10	
10:50	14.52	12.88	7.87	—	1.09	
Average	14.68	13.01	8.04	—	1.12	

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## EMISSION TEST RESULT

Client		Global Power Systems PCL	Run #		3
Date		20 Aug 24	Location		HRSO #1
Start Time		11:12	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO/CO <sub>2</sub> Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remark
11:12	14.70	13.07	8.05	—	1.28	
11:13	14.70	13.06	8.05	—	1.27	
11:14	14.69	13.05	8.04	—	1.26	
11:15	14.68	13.04	8.03	—	1.25	
11:16	14.67	13.03	8.02	—	1.24	
11:17	14.66	13.02	8.01	—	1.23	
11:18	14.65	13.01	8.00	—	1.22	
11:19	14.64	13.00	7.99	—	1.21	
11:20	14.63	12.99	7.98	—	1.20	
11:21	14.62	12.98	7.97	—	1.19	
11:22	14.61	12.97	7.96	—	1.18	
11:23	14.60	12.96	7.95	—	1.17	
11:24	14.59	12.95	7.94	—	1.16	
11:25	14.58	12.94	7.93	—	1.15	
11:26	14.57	12.93	7.92	—	1.14	
11:27	14.56	12.92	7.91	—	1.13	
11:28	14.55	12.91	7.90	—	1.12	
11:29	14.54	12.90	7.89	—	1.11	
11:30	14.53	12.89	7.88	—	1.10	
11:31	14.52	12.88	7.87	—	1.09	
11:32	14.51	12.87	7.86	—	1.08	
Average	14.68	13.01	8.04	—	1.12	

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## ANALYZER CALIBRATION DATA

Client		Global Power Systems PCL	Location		HRSO #1
Date		20 Aug 24	Test Operator		Sathaporn T
SO Analyzer Model		TELESTRYME API 2000H	Serial No.		720
NO <sub>x</sub> Analyzer Model		TELESTRYME API 2000H	Serial No.		720
CO Analyzer Model		TELESTRYME API 3000H	Serial No.		425

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01
NO <sub>2</sub> Gas	9.00	9.01	0.01

Sathaporn T

(M. Sathaporn Thakware)  
Environmental Field Scientist (2)FORM NO. 1 (REV. 01) REVISION NO. 1 (ISSUE DATE: 2012/01)  
ALS Laboratory Group

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client		Global Power Systems PCL		Location		HRSO #1	
Date		20 Aug 24		Test Operator		Sathaporn T	
SO Analyzer Model		TELESTRYME API 2000H		Serial No.		720	
NO <sub>x</sub> Analyzer Model		TELESTRYME API 2000H		Serial No.		720	
CO Analyzer Model		TELESTRYME API 3000H		Serial No.		425	

SO Analyzer		Initial Values		Final Values		Drift (% of Span)
Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	
NO <sub>2</sub> Gas	9.01	9.01	0.01	9.01	0.01	0.00
NO <sub>2</sub> Gas	10.04	10.04	0.16	10.11	0.26	0.12

NO<sub>x</sub> ANALYZER  
Cylinder Conc. (ppm)

Span (ppm) = 100

NO <sub>x</sub> Analyzer		Initial Values		Final Values		Drift (% of Span)
Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	
NO <sub>2</sub> Gas	9.01	9.01	0.01	9.01	0.01	0.00
NO <sub>2</sub> Gas	10.04	10.04	0.16	10.11	0.26	0.12

NO<sub>x</sub> ANALYZER  
Cylinder Conc. (ppm)

Span (ppm) = 100

CO Analyzer		Initial Values		Final Values		Drift (% of Span)
Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	
CO Gas	75.00	75.00	0.00	75.00	0.00	0.00
CO Gas	75.00	75.00	0.00	75.00	0.00	0.00

CO ANALYZER  
Cylinder Conc. (ppm)

Span (ppm) = 100

CO Analyzer		Initial Values		Final Values		Drift (% of Span)
Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	
CO Gas	75.00	75.00	0.00	75.00	0.00	0.00
CO Gas	75.00	75.00	0.00	75.00	0.00	0.00

CO ANALYZER  
Cylinder Conc. (ppm)

Span (ppm) = 100

Calibrated by





## EMISSION TEST RESULT

Client	Global Power Systems PCL	Run #	2
Date	21 Aug 24	Location	HRS04 #5
Start Time	10:41	Test Operator	Bourgeois L
NO <sub>x</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	822
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remarks
10:41	12.70	13.82	3.31	—	1.30	
10:42	12.71	13.81	3.31	—	1.30	
10:43	12.70	13.81	3.31	—	1.30	
10:44	12.71	13.81	3.31	—	1.30	
10:45	12.70	13.81	3.31	—	1.30	
10:46	12.71	13.81	3.31	—	1.30	
10:47	12.71	13.81	3.31	—	1.30	
10:48	12.70	13.81	3.31	—	1.30	
10:49	12.71	13.81	3.31	—	1.30	
10:50	12.70	13.81	3.31	—	1.30	
10:51	12.71	13.81	3.31	—	1.30	
10:52	12.70	13.81	3.31	—	1.30	
10:53	12.71	13.81	3.31	—	1.30	
10:54	12.70	13.81	3.31	—	1.30	
10:55	12.71	13.81	3.31	—	1.30	
10:56	12.70	13.81	3.31	—	1.30	
10:57	12.71	13.81	3.31	—	1.30	
10:58	12.70	13.81	3.31	—	1.30	
10:59	12.71	13.81	3.31	—	1.30	
11:00	12.70	13.81	3.31	—	1.30	
11:01	12.71	13.81	3.31	—	1.30	
11:02	12.70	13.81	3.31	—	1.30	
11:03	12.71	13.81	3.31	—	1.30	
11:04	12.70	13.81	3.31	—	1.30	
11:05	12.71	13.81	3.31	—	1.30	
11:06	12.70	13.81	3.31	—	1.30	
11:07	12.71	13.81	3.31	—	1.30	
11:08	12.70	13.81	3.31	—	1.30	
11:09	12.71	13.81	3.31	—	1.30	
11:10	12.70	13.81	3.31	—	1.30	
11:11	12.71	13.81	3.31	—	1.30	
11:12	12.70	13.81	3.31	—	1.30	
11:13	12.71	13.81	3.31	—	1.30	
11:14	12.70	13.81	3.31	—	1.30	
11:15	12.71	13.81	3.31	—	1.30	
11:16	12.70	13.81	3.31	—	1.30	
11:17	12.71	13.81	3.31	—	1.30	
11:18	12.70	13.81	3.31	—	1.30	
11:19	12.71	13.81	3.31	—	1.30	
11:20	12.70	13.81	3.31	—	1.30	
11:21	12.71	13.81	3.31	—	1.30	
11:22	12.70	13.81	3.31	—	1.30	
11:23	12.71	13.81	3.31	—	1.30	
11:24	12.70	13.81	3.31	—	1.30	
11:25	12.71	13.81	3.31	—	1.30	
11:26	12.70	13.81	3.31	—	1.30	
11:27	12.71	13.81	3.31	—	1.30	
11:28	12.70	13.81	3.31	—	1.30	
11:29	12.71	13.81	3.31	—	1.30	
11:30	12.70	13.81	3.31	—	1.30	
11:31	12.71	13.81	3.31	—	1.30	
11:32	12.70	13.81	3.31	—	1.30	
11:33	12.71	13.81	3.31	—	1.30	
11:34	12.70	13.81	3.31	—	1.30	
11:35	12.71	13.81	3.31	—	1.30	
11:36	12.70	13.81	3.31	—	1.30	
11:37	12.71	13.81	3.31	—	1.30	
11:38	12.70	13.81	3.31	—	1.30	
11:39	12.71	13.81	3.31	—	1.30	
11:40	12.70	13.81	3.31	—	1.30	
11:41	12.71	13.81	3.31	—	1.30	
11:42	12.70	13.81	3.31	—	1.30	
11:43	12.71	13.81	3.31	—	1.30	
11:44	12.70	13.81	3.31	—	1.30	
11:45	12.71	13.81	3.31	—	1.30	
11:46	12.70	13.81	3.31	—	1.30	
11:47	12.71	13.81	3.31	—	1.30	
11:48	12.70	13.81	3.31	—	1.30	
11:49	12.71	13.81	3.31	—	1.30	
11:50	12.70	13.81	3.31	—	1.30	
11:51	12.71	13.81	3.31	—	1.30	
11:52	12.70	13.81	3.31	—	1.30	
11:53	12.71	13.81	3.31	—	1.30	
11:54	12.70	13.81	3.31	—	1.30	
11:55	12.71	13.81	3.31	—	1.30	
11:56	12.70	13.81	3.31	—	1.30	
11:57	12.71	13.81	3.31	—	1.30	
11:58	12.70	13.81	3.31	—	1.30	
11:59	12.71	13.81	3.31	—	1.30	
12:00	12.70	13.81	3.31	—	1.30	
Average	12.70	13.81	3.31	—	1.30	

*Bourgeois L*  
(Mr. Bourgeois, Limited)  
Environmental Field Scientist (2)



## EMISSION TEST RESULT

Client	Global Power Systems PCL	Run #	2
Date	21 Aug 24	Location	HRS04 #5
Start Time	11:22	Test Operator	Bourgeois L
NO <sub>x</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	822
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remarks
11:22	12.81	13.82	3.32	—	1.30	
11:23	12.81	13.82	3.32	—	1.30	
11:24	12.81	13.82	3.32	—	1.30	
11:25	12.81	13.82	3.32	—	1.30	
11:26	12.81	13.82	3.32	—	1.30	
11:27	12.81	13.82	3.32	—	1.30	
11:28	12.81	13.82	3.32	—	1.30	
11:29	12.81	13.82	3.32	—	1.30	
11:30	12.81	13.82	3.32	—	1.30	
11:31	12.81	13.82	3.32	—	1.30	
11:32	12.81	13.82	3.32	—	1.30	
11:33	12.81	13.82	3.32	—	1.30	
11:34	12.81	13.82	3.32	—	1.30	
11:35	12.81	13.82	3.32	—	1.30	
11:36	12.81	13.82	3.32	—	1.30	
11:37	12.81	13.82	3.32	—	1.30	
11:38	12.81	13.82	3.32	—	1.30	
11:39	12.81	13.82	3.32	—	1.30	
11:40	12.81	13.82	3.32	—	1.30	
11:41	12.81	13.82	3.32	—	1.30	
11:42	12.81	13.82	3.32	—	1.30	
11:43	12.81	13.82	3.32	—	1.30	
11:44	12.81	13.82	3.32	—	1.30	
11:45	12.81	13.82	3.32	—	1.30	
11:46	12.81	13.82	3.32	—	1.30	
11:47	12.81	13.82	3.32	—	1.30	
11:48	12.81	13.82	3.32	—	1.30	
11:49	12.81	13.82	3.32	—	1.30	
11:50	12.81	13.82	3.32	—	1.30	
11:51	12.81	13.82	3.32	—	1.30	
11:52	12.81	13.82	3.32	—	1.30	
11:53	12.81	13.82	3.32	—	1.30	
11:54	12.81	13.82	3.32	—	1.30	
11:55	12.81	13.82	3.32	—	1.30	
11:56	12.81	13.82	3.32	—	1.30	
11:57	12.81	13.82	3.32	—	1.30	
11:58	12.81	13.82	3.32	—	1.30	
11:59	12.81	13.82	3.32	—	1.30	
12:00	12.81	13.82	3.32	—	1.30	
Average	12.81	13.82	3.32	—	1.30	

*Bourgeois L*  
(Mr. Bourgeois, Limited)  
Environmental Field Scientist (2)



## ANALYZER CALIBRATION DATA

Client	Global Power Systems PCL	Location	HRS04 #5
Date	21 Aug 24	Test Operator	Bourgeois L
O <sub>2</sub> ANALYZER Model	TELESTRYME API T200H	Serial No.	822
Span (%)	25		

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
N <sub>2</sub> O Gas	0.00	0.00	0.00
CO <sub>2</sub> Gas	15.00	15.00	0.00
CO Gas	15.00	15.00	0.00

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
N <sub>2</sub> O Gas	0.00	0.00	0.00
CO <sub>2</sub> Gas	15.00	15.00	0.00
CO Gas	15.00	15.00	0.00

Calibrated by  
*Bourgeois L*  
(Mr. Bourgeois, Limited)  
Environmental Field Scientist (2)

FORM NO. 1-01-01 REVISION NO. 3 ISSUE DATE: 2011-03  
ALS Laboratory Group

FORM NO. 1-01-01 REVISION NO. 3 ISSUE DATE: 2011-03  
ALS Laboratory Group

FORM NO. 1-01-01 REVISION NO. 3 ISSUE DATE: 2011-03  
ALS Laboratory Group



## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Global Power Systems PCL	Location	HRS04 #5
Date	21 Aug 24	Test Operator	Bourgeois L
O <sub>2</sub> ANALYZER Cylinder Conc. (%)	15.04	Span (%)	25

O <sub>2</sub> Analyzer Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	Drift (% of Span)
N <sub>2</sub> O Gas	0.00	0.00	0.00	0.00	0.00
CO <sub>2</sub> Gas	15.04	15.04	15.04	15.04	0.00

NO <sub>x</sub> ANALYZER Cylinder Conc. (ppm)	85.48	Span (ppm)	100
---	-------	------------	-----

NO <sub>x</sub> Analyzer Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	Drift (% of Span)
N <sub>2</sub> O Gas	0.00	0.00	0.00	0.00	0.00
CO <sub>2</sub> Gas	15.04	15.04	15.04	15.04	0.00

CO ANALYZER Cylinder Conc. (ppm)	79.85	Span (ppm)	100
----------------------------------	-------	------------	-----

CO Analyzer Calibration Response	System Calibration Response	System Calibration Response (% of Span)	System Calibration Response	System Calibration Response (% of Span)	Drift (% of Span)
N <sub>2</sub> O Gas	0.00	0.00	0.00	0.00	0.00
CO <sub>2</sub> Gas	15.04	15.04	15.04	15.04	0.00

Calibrated by  
*Bourgeois L*  
(Mr. Bourgeois, Limited)  
Environmental Field Scientist (2)

FORM NO. 1-01-01 REVISION NO. 3 ISSUE DATE: 2011-03  
ALS Laboratory Group



## EMISSION TEST RESULT

Client	Global Power Systems PCL	Run #	2
Date	21 Aug 24	Location	HRS04 #5
Start Time	10:36	Test Operator	Bourgeois L
NO <sub>x</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	822
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API T200H	Serial No.	844

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>2</sub> (ppm)	CO (ppm)	Remarks
10:36	12.70	13.82	3.31	—	1.30	
10:37	12.70	13.82	3.31	—	1.30	
10:38	12.70	13.82	3.31	—	1.30	
10:39	12.70	13.82	3.31	—	1.30	
10:40	12.70	13.82	3.31	—	1.30	
10:41	12.70	13.82	3.31	—	1.30	
10:42	12.70	13.82	3.31	—	1.30	
10:43	12.70	13.82	3.31	—	1.30	
10:44	12.70	13.82	3.31	—	1.30	
10:45	12.70	13.82	3.31	—	1.30	
10:46	12.70	13.82	3.31	—	1.30	
10:47	12.70	13.82	3.31	—	1.30	
10:48	12.70	13.82	3.31	—	1.30	
10:49	12.70	13.82	3.31	—	1.30	
10:50	12.70	13.82	3.31	—	1.30	
10:51	12.70	13.82	3.31	—	1.30	
10:52	12.70	13.82	3.31	—	1.30	
10:53	12.70	13.82	3.31	—	1.30	
10:54	12.70	13.82	3.31	—	1.30	
10:55	12.70	13.82	3.31	—	1.30	
10:56	12.70	13.82	3.31	—	1.30	
10:57	12.70	13.82	3.31	—	1.30	
10:58	12.70	13.82	3.31	—	1.30	
10:59	12.70	13.82	3.31	—	1.30	





## EMISSION TEST RESULT

Client	Global Power Systems PCL.	Run #	1
Date	21 Aug 24	Location	HRSG #6
Start Time	10:28	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Finish Time	10:30
NO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Serial No.	735
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	421

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:28	12.35	4.27	4.26	—	4.31	
10:29	12.31	4.34	4.31	—	4.34	
10:30	12.32	4.31	4.31	—	4.34	
10:31	12.34	4.30	4.30	—	4.32	
10:32	12.33	4.32	4.31	—	4.38	
10:33	12.32	4.31	4.31	—	4.32	
10:34	12.32	4.31	4.31	—	4.32	
10:35	12.31	4.29	4.32	—	4.32	
10:36	12.31	4.29	4.32	—	4.32	
10:37	12.31	4.29	4.32	—	4.32	
10:38	12.31	4.29	4.32	—	4.32	
10:39	12.31	4.29	4.32	—	4.32	
10:40	12.31	4.29	4.32	—	4.32	
10:41	12.31	4.29	4.32	—	4.32	
10:42	12.31	4.29	4.32	—	4.32	
10:43	12.31	4.29	4.32	—	4.32	
10:44	12.31	4.29	4.32	—	4.32	
10:45	12.31	4.29	4.32	—	4.32	
10:46	12.31	4.29	4.32	—	4.32	
10:47	12.31	4.29	4.32	—	4.32	
10:48	12.31	4.29	4.32	—	4.32	
10:49	12.31	4.29	4.32	—	4.32	
10:50	12.31	4.29	4.32	—	4.32	
Average	12.32	4.27	4.32	—	4.34	

Sathaporn T.

(M. Sathaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 3 of 5



## EMISSION TEST RESULT

Client	Global Power Systems PCL.	Run #	2
Date	21 Aug 24	Location	HRSG #6
Start Time	10:31	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Finish Time	10:31
NO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Serial No.	735
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	421

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:31	12.35	4.27	4.34	—	4.34	
10:32	12.32	4.31	4.31	—	4.34	
10:33	12.32	4.31	4.31	—	4.34	
10:34	12.32	4.31	4.31	—	4.34	
10:35	12.32	4.31	4.31	—	4.34	
10:36	12.32	4.31	4.31	—	4.34	
10:37	12.32	4.31	4.31	—	4.34	
10:38	12.32	4.31	4.31	—	4.34	
10:39	12.32	4.31	4.31	—	4.34	
10:40	12.32	4.31	4.31	—	4.34	
10:41	12.32	4.31	4.31	—	4.34	
10:42	12.32	4.31	4.31	—	4.34	
10:43	12.32	4.31	4.31	—	4.34	
10:44	12.32	4.31	4.31	—	4.34	
10:45	12.32	4.31	4.31	—	4.34	
10:46	12.32	4.31	4.31	—	4.34	
10:47	12.32	4.31	4.31	—	4.34	
10:48	12.32	4.31	4.31	—	4.34	
10:49	12.32	4.31	4.31	—	4.34	
10:50	12.32	4.31	4.31	—	4.34	
Average	12.32	4.31	4.31	—	4.34	

Sathaporn T.

(M. Sathaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 4 of 5



## EMISSION TEST RESULT

Client	Global Power Systems PCL.	Run #	3
Date	21 Aug 24	Location	HRSG #6
Start Time	11:12	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Finish Time	11:12
NO <sub>x</sub> Analyzer Model	TELESTRYME API 2000H	Serial No.	735
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	421

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>x</sub> (ppm)	CO (ppm)	Remark
11:12	12.35	4.28	4.37	—	4.36	
11:13	12.35	4.28	4.37	—	4.36	
11:14	12.35	4.28	4.37	—	4.36	
11:15	12.35	4.28	4.37	—	4.36	
11:16	12.35	4.28	4.37	—	4.36	
11:17	12.35	4.28	4.37	—	4.36	
11:18	12.35	4.28	4.37	—	4.36	
11:19	12.35	4.28	4.37	—	4.36	
11:20	12.35	4.28	4.37	—	4.36	
11:21	12.35	4.28	4.37	—	4.36	
11:22	12.35	4.28	4.37	—	4.36	
11:23	12.35	4.28	4.37	—	4.36	
11:24	12.35	4.28	4.37	—	4.36	
11:25	12.35	4.28	4.37	—	4.36	
11:26	12.35	4.28	4.37	—	4.36	
11:27	12.35	4.28	4.37	—	4.36	
11:28	12.35	4.28	4.37	—	4.36	
11:29	12.35	4.28	4.37	—	4.36	
11:30	12.35	4.28	4.37	—	4.36	
11:31	12.35	4.28	4.37	—	4.36	
11:32	12.35	4.28	4.37	—	4.36	
Average	12.35	4.28	4.37	—	4.36	

Sathaporn T.

(M. Sathaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 5 of 5



## ANALYZER CALIBRATION DATA

Client	Global Power Systems PCL.	Location	Auxiliary Boiler
Date	21 Aug 24	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	122

Time (min)	O <sub>2</sub> (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
10:28	12.35	0.00	0.00	0.00
10:29	12.35	0.00	0.00	0.00
10:30	12.35	0.00	0.00	0.00

NO <sub>x</sub> Analyzer Model		TELESTRYME API 1000H		Serial No.		122	
Span (ppm)		120					

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00	0.00
Low-Level Gas	25.68	25.45	25.28	-0.15
Span Gas	200.40	200.12	200.21	0.00

Battaporn T.

(M. Battaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 1 of 5



## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Global Power Systems PCL.	Location	Auxiliary Boiler
Date	21 Aug 24	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	122

Time (min)	O <sub>2</sub> (%)	Initial Analyzers Calibration Response (%)	System Calibration Response (%)	System Calibration Response (%)	System Calibration Response (%)	System Calibration Response (%)	Drift (% of Span)
10:28	12.35	0.00	0.00	0.00	0.00	0.00	0.00
10:29	12.35	0.00	0.00	0.00	0.00	0.00	0.00
10:30	12.35	0.00	0.00	0.00	0.00	0.00	0.00

NO <sub>x</sub> ANALYZER									
Cylinder Conc. (ppm) : 50.00					Span (ppm) : 100				
Time (min)	O <sub>2</sub> (%)	NO <sub>x</sub> Analyzer Calibration	Initial Values		Final Values		Drift	Drift (%)	Drift (ppm)
			System	System	System	System			
10:28	12.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10:29	12.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10:30	12.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Response	Calibration Response	Cal Bias (% of Span)	Calibration Response	Cal Bias (% of Span)	(% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00
US EPA Gas	80.12	80.23	0.11	82.00	1.88	1.77

CO ANALYZER

Battaporn T.

(M. Battaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 2 of 5



## EMISSION TEST RESULT

Client	Global Power Systems PCL.	Run #	1
Date	21 Aug 24	Location	Auxiliary Boiler
Start Time	10:00	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	—
NO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	—
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	544

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:00	12.35	4.28	4.37	—	4.36	
10:01	12.35	4.28	4.37	—	4.36	
10:02	12.35	4.28	4.37	—	4.36	
10:03	12.35	4.28	4.37	—	4.36	
10:04	12.35	4.28	4.37	—	4.36	
10:05	12.35	4.28	4.37	—	4.36	
10:06	12.35	4.28	4.37	—	4.36	
10:07	12.35	4.28	4.37	—	4.36	
10:08	12.35	4.28	4.37	—	4.36	
10:09	12.35	4.28	4.37	—	4.36	
10:10	12.35	4.28	4.37	—	4.36	
10:11	12.35	4.28	4.37	—	4.36	
10:12	12.35	4.28	4.37	—	4.36	
10:13	12.35	4.28	4.37	—	4.36	
10:14	12.35	4.28	4.37	—	4.36	
10:15	12.35	4.28	4.37	—	4.36	
10:16	12.35	4.28	4.37	—	4.36	
10:17	12.35	4.28	4.37	—	4.36	
10:18	12.35	4.28	4.37	—	4.36	
10:19	12.35	4.28	4.37	—	4.36	
10:20	12.35	4.28	4.37	—	4.36	
Average	12.35	4.28	4.37	—	4.36	

Battaporn T.

(M. Battaporn Thabane)

Environmental Field Scientist (2)

FORM NO. F-01-02 REVISION NO. 1 ISSUE DATE: 2017/01  
ALS Laboratory Group

Page 3 of 5



## EMISSION TEST RESULT

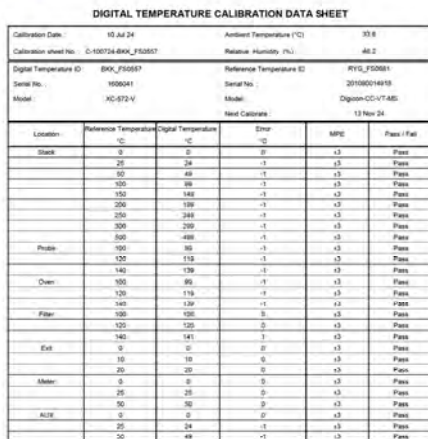
Client	Global Power Systems PCL.	Run #	2
Date	21 Aug 24	Location	Auxiliary Boiler
Start Time	10:21	Test Operator	Battaporn T.
SO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	—
NO <sub>x</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	—
CO/CO <sub>2</sub> Analyzer Model	TELESTRYME API 1000H	Serial No.	544

Time (min)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	NO <sub>x</sub> (ppm)	SO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:21	12.35	4.27	4.31	—	4.31	
10:22	12.34	4.26	4.30	—	4.30	
10:23	12.35	4.27	4.31	—	4.31	
10:24	12.34	4.27	4.30	—	4.30	
10:25	12.35	4.26	4.30	—	4.30	
10:26	12.34	4.26	4.30	—	4.30	
10:27	12.35	4.26	4.30	—	4.30	
10:28	12.34	4.26	4.30	—	4.30	
10:29	12.35	4.27	4.31	—	4.31	
10:30	12.34	4.26	4.30	—	4.30	
10:31	12.35	4.26	4.30	—	4.30	
10:32	12.34	4.26	4.30	—	4.30	
10:33	12.35	4.27	4.31	—	4.31	
10:34	12.34	4.26	4.30	—	4.30	
10:35	12.35	4.26	4.30	—	4.30	
10:36	12.34	4.26	4.30	—	4.30	
10:37	12.35	4.26	4.30	—	4.30	
10:38	12.34	4.26	4.30	—	4.30	
10:39	12.35	4.26	4.30	—	4.30	
10:40	12.34	4.26	4.30	—	4.30	
10:41	12.35	4.27	4.31	—	4.31	







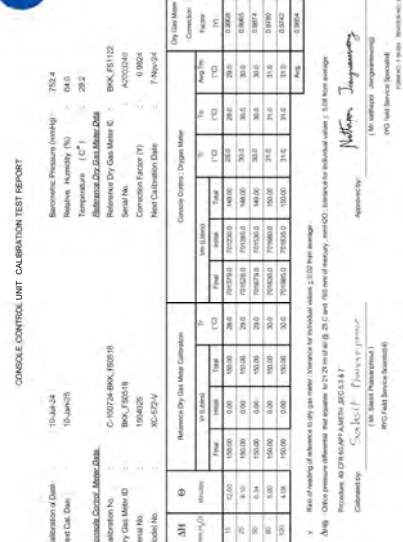


Calculated by: Sakot Phansomphol Approved by: Pathan Jongsamwang  
Mr. Sakot Phansomphol Mr. Pathan Jongsamwang  
RYG Field Service Scientist (R) RYG Field Service Specialist (T)

FORM NO. F-06 (2017) REVISION NO. 2 ISSUE DATE: 8-Feb-2018

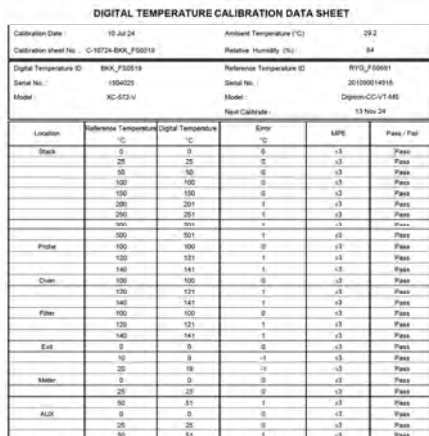


Collected by Sahar Thairanpant      Assigned by Netra Jainwary  
[ Mr. Sahar Thairanpant ]      [ Mr. Netra Jainwary ]  
RPO Field Service Submitted (4)      RPO Field Service Submitted (1)



Run No.	Time Actual (in sec)	Time Reading (in sec)	Diff. (sec)	Diff. (mm)
1	5:00:03	5:00	3	0.00003
2	5:00:07	5:00	7	0.00007
3	5:00:07	5:00	7	0.00007
4	5:00:06	5:00	6	0.00006
5	5:00:05	5:00	5	0.00005
6	5:00:06	5:00	6	0.00006
7	5:00:06	5:00	6	0.00006
8	5:00:06	5:00	6	0.00006
9	5:00:07	5:00	7	0.00007
10	5:00:07	5:00	7	0.00007
			Average	0.00010
			SD	0.00002

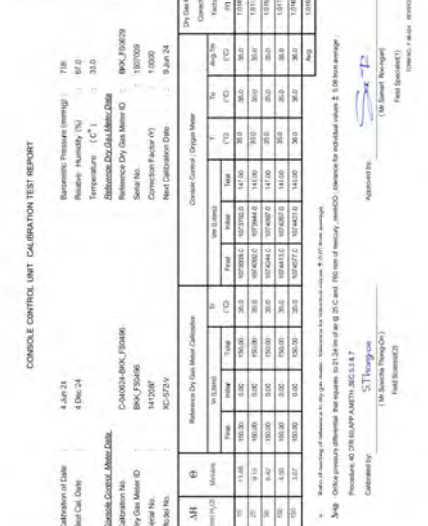
Calibration by: <u>Sakshi Phansapkar</u>	Approved by: <u>Nathaporn Jengnansong</u>
Mr. Sakshi Phansapkar	Mr. Nathaporn Jengnansong
RYG Field Service Scientist (4)	RYG Field Service Specialist (1)

[illegible]

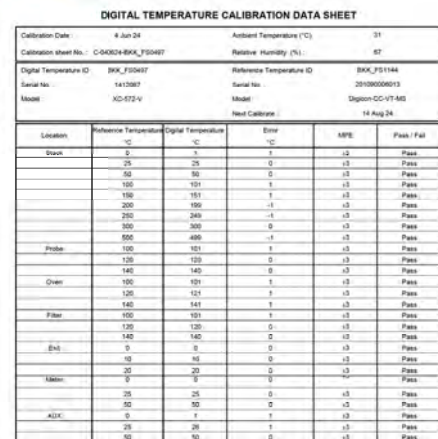
Where:

- $D_2, D_1, D_3$  = Strand diameter, 60 degrees to each other, each measured the nearest 0.05 mm.
- $\Delta C$  = Maximum distance between any two elements, may be  $\leq 0.100$  mm.
- $D_m$  =  $D_2 + D_1 + D_3 / 3$

Saksit Phaisanponn _____ ( Mr. Saksit Phaisanponn ) RNYG Field Service Specialist (B)	Natthapon Jangnamwong _____ ( Mr. Natthapon Jangnamwong ) RNYG Field Service Specialist (C)
--	--



Calibrate by: S. Thongon Approved by: S. T.  
(Mr. Sawicha Thong-On) (Mr. Samet Ruo-ngin)  
Field Scientist (2) Zoologist (1)



APR: (Maximum permissible error of measurement)  $\leq \frac{\text{range}}{n}$   $\frac{100}{1000000} = 0.0001$

Generated by: S.Thongee Approved by: S.P.

(Mr. Satchith Thongee O.) (Mr. Samrat Phisangri)

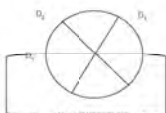
Field Scientist (2) Specialist (1)

FORM NO. F 04-027 REVISION NO. 2 (ISSUE DATE: 1 Feb 2011)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET									
Calibration Date	5-Jul-24	Revision No.	001	Instrument ID	BKX_F50551	Verion ID	BKX_F51131	RYG_F50539	
Calibration Sheet No.	C-00024-BKX-F50551								
Probe ID	Probe Diameter (mm)	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	D <sub>7</sub>	D <sub>8</sub>
1	0.315	0.315	0.315	0.315	0.315	0.315	0.315	0.315	0.315
2	0.475	0.475	0.475	0.475	0.475	0.475	0.475	0.475	0.475
3	0.530	0.530	0.530	0.530	0.530	0.530	0.530	0.530	0.530
4	0.635	0.635	0.635	0.635	0.635	0.635	0.635	0.635	0.635
5	0.730	0.730	0.730	0.730	0.730	0.730	0.730	0.730	0.730
6	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
7	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110	1.110
8	1.270	1.270	1.270	1.270	1.270	1.270	1.270	1.270	1.270
9	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600

Where:  
 $D_1, D_2, D_3, D_4, D_5, D_6, D_7, D_8$  = Seven different nozzle diameters at 90 degrees to each other, each measured to the nearest 0.025 mm.  
 $\Delta D$  = Maximum difference between any two diameters, read to  $\pm 0.100$  mm.  
 $D_{avg}$  =  $(D_1 + D_2 + D_3 + D_4 + D_5 + D_6 + D_7 + D_8) / 8$



Calibrated by: S. Thong  
 (Mr. Sathit Thongthong)  
 Field Scientist (2)

Approved by: S. Thong  
 (Mr. Sathit Thongthong)  
 Field Scientist (2)

Type S Pitot Tube Calibration									
Date Calibration	10-Jul-24	Due Date	10-Jul-25	Instrument ID	BKX_F50551	Verion ID	BKX_F51131	RYG_F50539	
Pitot ID	BKX_F50551								
Pitot SN									
Parameter	Value	Allowable Range	Check						
a1	2.4	$-10^\circ \leq a1 < +10^\circ$	OK						
a2	-1.2	$-10^\circ \leq a2 < +10^\circ$	OK						
B1	-2.0	$-5^\circ \leq B1 < +5^\circ$	OK						
B2	1.3	$-5^\circ \leq B2 < +5^\circ$	OK						
Y	0.3								
B	0.2								
Z = A tan y	0.005	$Z \leq 0.125^\circ$	OK						
W = A tan B	0.003	$W \leq 0.031^\circ$	OK						
D1	0.310	$0.188^\circ \leq D1 \leq 0.375^\circ$	OK						
A/2D1	1.468	$1.05 \leq A/D1 \leq 1.5$	OK						
A	0.91	$2.10 \leq A \leq 3.0$	OK						

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

Calibrated by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

Approved by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

Type S Pitot Tube Calibration									
Date Calibration	10-Jul-24	Due Date	10-Jul-25	Instrument ID	BKX_F50551	Verion ID	BKX_F51131	RYG_F50539	
Pitot ID	BKX_F50551								
Pitot SN									
Parameter	Value	Allowable Range	Check						
a1	-2.4	$-10^\circ \leq a1 < +10^\circ$	OK						
a2	2.4	$-10^\circ \leq a2 < +10^\circ$	OK						
B1	-1.2	$-5^\circ \leq B1 < +5^\circ$	OK						
B2	1.6	$-5^\circ \leq B2 < +5^\circ$	OK						
Y	-1.1								
B	0.2								
Z = A tan y	-0.018	$Z \leq 0.125^\circ$	OK						
W = A tan B	0.003	$W \leq 0.031^\circ$	OK						
D1	0.308	$0.188^\circ \leq D1 \leq 0.375^\circ$	OK						
A/2D1	1.494	$1.05 \leq A/D1 \leq 1.5$	OK						
A	0.92	$2.10 \leq A \leq 3.0$	OK						

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

Calibrated by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

Approved by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

FORM NO. F50-134 REVISION NO. 0 ISSUE DATE: 25/03/23

FORM NO. F50-134 REVISION NO. 0 ISSUE DATE: 25/03/23

Type S Pitot Tube Calibration									
Date Calibration	5-Jul-24	Due Date	1-Jan-25	Instrument ID	BKX_F50551	Verion ID	BKX_F51131	RYG_F50539	
Pitot ID	BKX_F50551								
Pitot SN									
Parameter	Value	Allowable Range	Check						
a1	2.4	$-10^\circ \leq a1 < +10^\circ$	OK						
a2	-1.1	$-10^\circ \leq a2 < +10^\circ$	OK						
B1	-0.4	$-5^\circ \leq B1 < +5^\circ$	OK						
B2	9.3	$-5^\circ \leq B2 < +5^\circ$	OK						
Y	1.3								
B	1.4								
Z = A tan y	0.020	$Z \leq 0.125^\circ$	OK						
W = A tan B	0.021	$W \leq 0.031^\circ$	OK						
D1	0.375	$0.188^\circ \leq D1 \leq 0.375^\circ$	OK						
A/2D1	1.160	$1.05 \leq A/D1 \leq 1.5$	OK						
A	0.87	$2.10 \leq A \leq 3.0$	OK						

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

Calibrated by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

Approved by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

FORM NO. F50-134 REVISION NO. 0 ISSUE DATE: 25/03/23

Type S Pitot Tube Calibration									
Date Calibration	10-Jul-24	Due Date	10-Jan-25	Instrument ID	BKX_F50551	Verion ID	BKX_F51131	RYG_F50539	
Pitot ID	BKX_F50551								
Pitot SN									
Parameter	Value	Allowable Range	Check						
a1	-1.8	$-10^\circ \leq a1 < +10^\circ$	OK						
a2	-1.4	$-10^\circ \leq a2 < +10^\circ$	OK						
B1	-1.7	$-5^\circ \leq B1 < +5^\circ$	OK						
B2	-2	$-5^\circ \leq B2 < +5^\circ$	OK						
Y	-1.3								
B	-0.4								
Z = A tan y	-0.020	$Z \leq 0.125^\circ$	OK						
W = A tan B	-0.006	$W \leq 0.031^\circ$	OK						
D1	0.300	$0.188^\circ \leq D1 \leq 0.375^\circ$	OK						
A/2D1	1.394	$1.05 \leq A/D1 \leq 1.5$	OK						
A	0.92	$2.10 \leq A \leq 3.0$	OK						

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

Calibrated by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

Approved by: S. Thong  
 (Mr. Sathit Thongthong)  
 RYG Field Services Scientist (4)

FORM NO. F50-134 REVISION NO. 0 ISSUE DATE: 25/03/23

ENTECH

Calibration Certificate

Certificate No: 075052

Date of Issue: 20-Jan-24

Instrument description

Flow Gas Analysis

Instrument model

Tecum 250 New

Control and serial no.

020000001121

Instrument serial no.

020000001121

ID no. or control no.

RYG\_F50551

Probe description

Tecum 250 to 250

Probe serial no.

Customer name

ALB LABORATORY GROUP (THAILAND) CO., LTD.

Customer address

194 Thuythuan 16, Thuythuan Road, Chong Chong, Thuythuan, Binh Duong, Ho Chi Minh City, Vietnam

Total pages of certificate

1 Page

Receiving date

25-Jan-24

Receiving time

10:00 AM

Condition of UAC

Good

Assembly condition

Good

Calibration plan

1/2121 250 (New) 250 to 250

Calibration procedure no.

1/2121 250 (New) 250 to 250

1/2121 250 (New) 250 to 250

1/2121 250 (New) 250 to 250

1/2121 250 (New) 250 to 250

1/2121 250 (New) 250 to 250

ENTECH

Calibration Certificate

Certificate No: 075052

Date of Issue: 20-Jan-24

Standard References (Table 1)

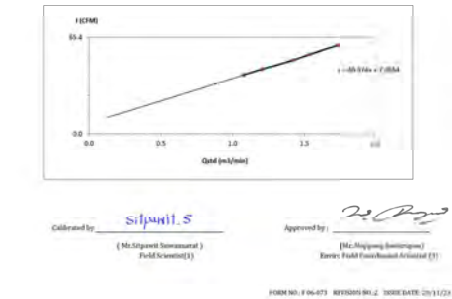
Standard	Certificate No.	Version	Issue Date
EN 10370-1	075052-1	1.0	20-Jan-24
EN 10370-2	075052-2	1.0	20-Jan-24
EN 10370-3	075052-3	1.0	20-Jan-24
EN 10370-4	075052-4	1.0	20-Jan-24
EN 10370-5	075052-5	1.0	20-Jan-24
EN 10370-6	075052-6	1.0	20-Jan-24
EN 10370-7	075052-7	1.0	20-Jan-24
EN 10370-8	075052-8	1.0	20-Jan-24
EN 10370-9	075052-9	1.0	20-Jan-24
EN 10370-10	075052-10	1.0	20-Jan-24
EN 10370-11	075052-11	1.0	20-Jan-24
EN 10370-12	075052-12	1.0	20-Jan-24
EN 10370-13	075052-13	1.0	20-Jan-24
EN 10370-14	075052-14	1.0	20-Jan-24
EN 10370-15	075052-15	1.0	20-Jan-24
EN 10370-16	075052-16	1.0	20-Jan-24
EN 10370-17	075052-17	1.0	20-Jan-24
EN 10370-18	075052-18	1.0	20-Jan-24
EN 10370-19	075052-19	1.0	20-Jan-24
EN 10370-20	075052-20	1.0	20-Jan-24
EN 10370-21	075052-21	1.0	20-Jan-24
EN 10370-22	075052-22	1.0	20-Jan-24
EN 10370-23	075052-23	1.0	20-Jan-24
EN 10370-24	075052-24	1.0	20-Jan-24
EN 10370-25	075052-25	1.0	20-Jan-24
EN 10370-26	075052-26	1.0	20-Jan-24
EN 10370-27	075052-27	1.0	20-Jan-24
EN 10370-28	075052-28	1.0	20-Jan-24
EN 10370-29	075052-29	1.0	20-Jan-24
EN 10370-30	075052-30	1.0	20-Jan-24
EN 10370-31	075052-31	1.0	20-Jan-24
EN 10370-32	075052-32	1.0	20-Jan-24
EN 10370-33	075052-33	1.0	20-Jan-24
EN 10370-34	075052-34	1.0	20-Jan-24
EN 10370-35	075052-35	1.0	20-Jan-24
EN 10370-36	075052-36	1.0	20-Jan-24
EN 10370-37	075052-37	1.0	20-Jan-24
EN 10370-38	075052-38	1.0	20-Jan-24
EN 10370-39	075052-39	1.0	20-Jan-24
EN 10370-40	075052-40	1.0	20-Jan-24
EN 10370-41	075052-41	1.0	20-Jan-24
EN 10370-42	075052		







ALS logo and project details for High Volume Air Sampler Calibration Worksheet. Includes fields for Project Name, Location, Date, and various calibration parameters like Temperature, Humidity, and Flow Rate.



Sartorius (Thailand) Co., Ltd. Certificate of Calibration. Includes fields for Model Number, Description, Serial Number, ID No., and Manufacturer. It also contains a table for Calibration Results and a section for Remarks.

Sartorius (Thailand) Co., Ltd. Certificate of Calibration. Includes fields for Model Number, Description, Serial Number, ID No., and Manufacturer. It also contains a table for Calibration Results and a section for Remarks.

ALS logo and MULTIPOINT CALIBRATION REPORT. Includes fields for Calibration Date, Manufacturer, Model, and various calibration parameters. It also contains a table for Calibration Results and a section for Remarks.



ALS logo and MULTIPOINT CALIBRATION REPORT. Includes fields for Calibration Date, Manufacturer, Model, and various calibration parameters. It also contains a table for Calibration Results and a section for Remarks.

J NAC logo and Certificate of Calibration. Includes fields for Model Number, Description, Serial Number, ID No., and Manufacturer. It also contains a table for Calibration Results and a section for Remarks.

J NAC logo and Certificate of Calibration. Includes fields for Model Number, Description, Serial Number, ID No., and Manufacturer. It also contains a table for Calibration Results and a section for Remarks.

J NAC logo and Certificate of Calibration. Includes fields for Model Number, Description, Serial Number, ID No., and Manufacturer. It also contains a table for Calibration Results and a section for Remarks.



Page 1 of 1 Pages

Measurement Item	/ Relative humidity with data logger
Manufacturer	Nidegen
Model/Type	117W5-202X-G
Serial Number	12078
Lot No.	FW17050448
Location	R/L Laboratory Corp (Thailand) Co., Ltd. 129 Pathumwan Rd., Pathumwan Rd., Khwaeng Siam, Samsi, North Siam, Bangkok, Bangkok 10200 (THAILAND)

**Measurement Method:**  
The measurement was performed in an ambient temperature of 25±0.2°C and relative humidity of 50±1.02%.  
The indoor climate calibration (IACC) was certified by comparison method with standard (standard error: hygrometer model 1902) so the humidity generator chamber is determined the accuracy.



**Traceability:**  
This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology is the international system of units (SI) via MGR Calibration, Inc. Certificate number: 202205-001, the date from Sep 26, 2024.

Measurement Date	July 20, 2023
Report Date	July 22, 2023

**Measurement Results:**  
This equipment was connected with indoor air quality printer and displayed 5.93 on display, Model: HMP45, Serial num: Bn-V192316.  
Calibration was performed in the range of 20%RH to 80%RH.

The results of indicators are reported in table below.

Determined Rating	Indicator Rating	SAC Rating	UPP Rating	Accuracy
90	25.07	20.7	0.8	0.00
50	50.29	49.1	-1.1	0.01
80	80.30	79.1	-1.2	0.01

Reviewed by:  Approved Signature:   
☐ No. Scored Threshold  
☐ Missed Score Threshold  
 M. Peling Soudan  
 Calibration Department Manager

---

## CERTIFICATE OF CALIBRATION

ROTA METER CALIBRATION RESULT JULY 2024			
Rotameter ID	Calibration Date	Regression Result	Coefficient (R <sup>2</sup> )
BKF_FS0577	01 Jul 24	$Y = 1.0001X - 0.0433$	1.0000
BKF_FS0584	01 Jul 24	$Y = 1.0009X - 2.7974$	1.0000
BKF_FS0585	02 Jul 24	$Y = 1.0315X - 3.0033$	0.9998
BKF_FS0587	02 Jul 24	$Y = 1.0294X + 0.71$	1.0000
BKF_FS0588	01 Jul 24	$Y = 0.9751X - 8.8452$	1.0000
BKF_FS0591	01 Jul 24	$Y = 1.0039X - 8.2303$	1.0000
BKF_FS0592	02 Jul 24	$Y = 1.0002X - 14.273$	1.0000
BKF_FS0596	02 Jul 24	$Y = 1.0001X - 0.0095$	1.0000
BKF_FS0598	01 Jul 24	$Y = 1.0001X - 114.097$	0.9998
BKF_FS1004	02 Jul 24	$Y = 0.9626X + 13.51$	0.9997
BKF_FS1005	02 Jul 24	$Y = 1.0217X - 0.5833$	0.9999
BKF_FS1006	02 Jul 24	$Y = 1.148x - 1.0422$	0.9991
BKF_FS1007	02 Jul 24	$Y = 1.1118x + 3.3558$	0.9984
BKF_FS1008	02 Jul 24	$Y = 1.1273x - 0.4837$	0.9999
BKF_FS1009	01 Jul 24	$Y = 1.1044x - 0.8245$	1.0000
BKF_FS1017	02 Jul 21	$Y = 1.0496x - 0.2907$	0.9998
BKF_FS1018	02 Jul 21	$Y = 1.0173x - 1.2067$	0.9998
BKF_FS1019	02 Jul 21	$Y = 1.0022x + 0.5166$	1.0000
BKF_FS1026	01 Jul 24	$Y = 1.0002X - 2.4054$	1.0000
BKF_FS1027	01 Jul 24	$Y = 1.0014X - 4.786$	0.9999
BKF_FS1028	01 Jul 24	$Y = 1.0009X - 3.7755$	1.0000
BKF_FS1029	01 Jul 24	$Y = 1.1118x - 4.4431$	0.9995
BKF_FS1030	01 Jul 24	$Y = 1.0159x - 6.395$	1.0000
BKF_FS1031	01 Jul 24	$Y = 0.9979X - 5.3371$	1.0000
BKF_FS1039	02 Jul 24	$Y = 0.9992x - 0.4933$	0.9992
BKF_FS1040	01 Jul 24	$Y = 1.0034x - 2.5343$	1.0000
BKF_FS1041	02 Jul 24	$Y = 1.0511x + 1.1272$	0.9995
BKF_FS1042	02 Jul 24	$Y = 1.0216x + 10.367$	0.9998
BKF_FS1043	01 Jul 24	$Y = 0.9995x - 0.2143$	1.0000
BKF_FS1044	02 Jul 24	$Y = 1.0351X + 4.4231$	0.9991
BKF_FS1030	01 Jul 24	$Y = 0.9337x - 1.0166$	0.9994
BKF_FS1201	01 Jul 24	$Y = 0.9871x + 5.0901$	0.9998
BKF_FS1202	01 Jul 24	$Y = 0.7978x + 301.39$	0.9334
PHK_FS0007	02 Jul 24	$Y = 0.7722x + 3.4395$	0.9988
PHK_FS0028	02 Jul 24	$Y = 1.0254x + 1.04$	1.0000
PHK_FS0029	02 Jul 24	$Y = 0.998x + 12.73$	1.0000
RYG_FS0197	01 Jul 24	$Y = 1.0045x + 10.261$	1.0000
RYG_FS0198	01 Jul 24	$Y = 1.0056x + 1.8863$	1.0000
RYG_FS0196	02 Jul 24	$Y = 1.0029x + 3.2381$	0.9995



SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0008  
Page: 1 of 3

Calibration Procedure: CP-AC-03

Calibration Method:

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

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

Condition of this result of calibration:

1. Reference Standard Instruments:

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY5230742	EP-009-23	07-FEB-24
Digital Multimeter	33461A	MY5320104	EEL-IP-201266	13-FEB-24
Digital Multimeter	33461A	MY5320106	EEL-IP-201267	13-FEB-24
Digital Multimeter	33461A	MY6032473	EEL-IP-210266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-001-23	08-FEB-24
Condenser Microphone	4180	297900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	3450405	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	Y5480466	EP-002-23	10-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

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

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACC4008  
Job No.: VC67AC0058  
Page: 1 of 3

Result of calibration:

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.98	-0.02	0.13	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.83	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

T. Petcha

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 1 of 8

Calibration Procedure: CP-AC-01

Calibration Method:

This equipment was calibrated by follow on IEC-61677-3:2013 Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal item of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test 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	MY4067076	EP-009-23	07-FEB-24
Waveform Generator	33511B	MY5230742	EP-001-23	07-FEB-24
Digital Multimeter	33461A	MY5320104	EEL-IP-201266	13-FEB-24
Digital Multimeter	33461A	MY5320106	EEL-IP-201267	13-FEB-24
Digital Multimeter	33461A	MY6032473	EEL-IP-210266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-001-23	08-FEB-24
Condenser Microphone	4180	297900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	3450405	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

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

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 1 of 8

Summary of Measurement Result:

Parameter	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 1 kHz	0.2	0.6
For > 1 kHz to 10 kHz	0.2	0.7
For > 10 kHz to 20 kHz	0.2	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 uncertainty 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 indicator	0.2	0.25
12. High level stability	0.1	0.1

T. Petcha

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 1 of 8

4. Electrical signal item of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.8
125	0.0	0.1	0.0	±1.2
250	0.0	0.0	0.0	±1.1
500	0.0	0.1	0.0	±1.2
1000	0.0	0.0	0.0	±1.8
2000	0.0	0.1	0.0	±2.8
4000	0.0	0.5	0.0	±3.6
8000	0.0	0.1	0.1	±3.6

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.5

5.2 Time weightings at 1 kHz

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

6. Long-term stability

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

T. Petcha

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 1 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1

T. Petcha

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 1 of 8

Calibration Certificate

Equipment: SURROUND LEVEL METER  
Manufacturer: RION  
Model: RL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00623357 / 140634 / 26415  
ID No.: RYG\_F50613

Condition At Found: GOOD

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

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

Received Date: 19 DECEMBER 2023  
Calibration Date: 05-06 JANUARY 2024  
Date of Issue: 09 JANUARY 2024

Calibrated by: Tattakorn Phuangman

Approved by:

T. Petcha  
(Thakul Petcha)

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

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference / Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
119.9 (93.90)	93.9	0.0	±0.2

2. Self-generated noise

2.1. Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.8
Flat	23.6

3. Acoustical signal tests of frequency weightings

Mini two-third octave acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.6	0.7	0.7	±2.0

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinakharinwirot Road, Bangrak, Bangkok, 10700 Thailand  
Tel: +66 2453 8531 Email: calibration@sithiporn.com



Cert. No.: ACL24009  
Job No.: VC67AC0044  
Page: 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	Time burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.75	1	109.0	109.0	-0.1	1.0; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured Value, 1 peak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±5.0
Cut	136.4	136.3	-0.1	±5.0

Number of cycles in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petcha



Cert. No.: ACL230324  
Job No.: VC67AC0011  
Pages: 3 of 8Cert. No.: ACL33324  
Job No.: VC67AC0011  
Pages: 1 of 8

## Calibration Certificate

Equipment: SOUND LEVEL METER  
Manufacturer: RION  
Model: NL-42; Microphone UC-52 / Pre-amplifier SB-24  
Serial No.: 00871106 / 17184 / 73485  
ID No.: RYG\_190064

Condition As Found: GOOD

Customer: ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KJWANG PHATHANAKAN, KHET SUANLUANG,  
BANGKOK, 10250 THAILAND.

Location: ( 23.0 ± 0.1 ) °C  
Ambient Temperature: ( 101.3 ± 0.3 ) kPa  
Pressure: ( 50.0 ± 2.0 ) %  
Relative Humidity:  
Received Date: 11 OCTOBER 2023  
Calibration Date: 19-20 OCTOBER 2023  
Date of Issue: 24 OCTOBER 2023

Calibrated by: Sathakorn Panpakorn

Approved by:

*T. Petch*  
( Thanakul Petchai )

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

QP-TS12-04-04-02066

Cert. No.: ACL230324  
Job No.: VC67AC0011  
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-0099-23	27 FEB-24
Waveform Generator	33511B	MY52302742	EF-0101-23	27 FEB-24
Digital Multimeter	33461A	MY53202704	EEL BP 340266	13 FEB-24
Digital Multimeter	33461A	MY53202076	EEL BP 340266	13 FEB-24
Digital Multimeter	34461A	MY50024273	EEL BP 340266	14 FEB-24
Programmable Acoustics	SAAT-1070	62106114	EF-0011-23	08 FEB-24
Condenser Microphone	4108	297700	AA-1001-23	14 FEB-24
Measuring Amplifier	NA-435KJ	34504095	AA-3002-23	14 FEB-24

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

This certificate is traceable to the international system of unit maintained as:

3.1 National Institute of Metrology (Thailand).

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

QP-TS12-04-04-02066

*T. Petch*

Cert. No.: ACL33324  
Job No.: VC67AC0011  
Pages: 3 of 8

## SUMMARY OF MEASUREMENT RESULTS:

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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.35	0.35
11. Overload indication	✓	-	0.2	0.25
12. High-level stability	✓	-	0.1	0.1

Note: Pass/Fail evaluation for each parameter,  
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QP-TS12-04-04-02066

*T. Petch*

Cert. No.: ACL33324  
Job No.: VC67AC0011  
Pages: 1 of 8

## RESULTS OF CALIBRATION:

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
16.8

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

Frequency Weighting	Measured value (dB)
A-weight	11.3
C-weight	17.5
Flat	23.1

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits (dB)
125	0.4	0.1	0.5	±1.3
1000	0.0	0.0	0.0	±1.0
8000	-1.2	-1.1	-1.1	±3.9

QP-TS12-04-04-02066

*T. Petch*

Cert. No.: ACL33324  
Job No.: VC67AC0011  
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
130.0	130.0	0.0	±1.1
129.0	129.0	0.0	±1.1
128.0	128.0	0.0	±1.1
127.0	127.0	0.0	±1.1
126.0	126.0	0.0	±1.1
125.0	125.0	0.0	±1.1
124.0	124.0	0.0	±1.1
123.0	123.0	0.0	±1.1
122.0	122.0	0.0	±1.1
121.0	121.0	0.0	±1.1
120.0	120.0	0.0	±1.1
119.0	119.0	0.0	±1.1
118.0	118.0	0.0	±1.1
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1
74.0	74.0	0.0	±1.1
73.0	73.0	0.0	±1.1
72.0	72.0	0.0	±1.1
71.0	71.0	0.0	±1.1
70.0	70.0	0.0	±1.1
69.0	69.0	0.0	±1.1
68.0	68.0	0.0	±1.1
67.0	67.0	0.0	±1.1
66.0	66.0	0.0	±1.1
65.0	65.0	0.0	±1.1
64.0	64.0	0.0	±1.1
63.0	63.0	0.0	±1.1
62.0	62.0	0.0	±1.1
61.0	61.0	0.0	±1.1
60.0	60.0	0.0	±1.1
59.0	59.0	0.0	±1.1
58.0	58.0	0.0	±1.1
57.0	57.0	0.0	±1.1
56.0	56.0	0.0	±1.1
55.0	55.0	0.0	±1.1
54.0	54.0	0.0	±1.1
53.0	53.0	0.0	±1.1
52.0	52.0	0.0	±1.1
51.0	51.0	0.0	±1.1
50.0	50.0	0.0	±1.1
49.0	49.0	0.0	±1.1
48.0	48.0	0.0	±1.1
47.0	47.0	0.0	±1.1
46.0	46.0	0.0	±1.1
45.0	45.0	0.0	±1.1
44.0	44.0	0.0	±1.1
43.0	43.0	0.0	±1.1
42.0	42.0	0.0	±1.1
41.0	41.0	0.0	±1.1
40.0	40.0	0.0	±1.1
39.0	39.0	0.0	±1.1
38.0	38.0	0.0	±1.1
37.0	37.0	0.0	±1.1
36.0	36.0	0.0	±1.1
35.0	35.0	0.0	±1.1
34.0	34.0	0.0	±1.1
33.0	33.0	0.0	±1.1
32.0	32.0	0.0	±1.1
31.0	31.0	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

QP-TS12-04-04-02066

*T. Petch*

Cert. No.: ACL33324  
Job No.: VC67AC0011  
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. Time burst response

Time Weighting	Time burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.3; -5.0
	2	8	117.0	117.0	0.0	1.3; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.3; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	94.0	94.9	+0.9	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.3; -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 <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Burst	135.4	135.8	-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	±2.0
Positive half cycle	133.4	133.2	-0.2	±2.0
Negative half cycle	133.4	133.2	-0.2	±2.0

QP-TS12-04-04-02066

*T. Petch*

Cert. No.: ACL33324  
Job No.: VC67AC0011  
Pages: 8 of 8

## 11. Overload indication

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

QP-TS12-04-04-02066

*T. Petch*



Cert. No.: ACL23325  
Pages: 1 of 8

## Calibration Certificate

Equipment: SOUND LEVEL METER  
Manufacturer: RION  
Model: NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 0107242 / 140911 / 73484  
ID No.: RYG, F80386

Condition As Found: GOOD

Customer: AJS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KHAOYANG PHATHANAKAN, 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: 11 OCTOBER 2023  
Calibration Date: 19-20 OCTOBER 2023  
Date of Issue: 24 OCTOBER 2023

Calibrated by: Nishikorn Pongpikul

Approved by: T. Petchai  
( Thakul Petchai )

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

QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No.: ACL23325  
Job No.: VCB7AC001  
Pages: 2 of 8

Calibration Procedure: QPAC-01

## Calibration Method:

This equipment was calibrated by hand on (IEC 61672-3 (20:3) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference  
Standard Instruments.

For tests results of each device was made by other copies of each instrument display and state 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	MY40017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY32302742	EF-0010-23	07-FEB-24
Digital Multimeter	34461A	MY31203034	PFL-RP 905066	13-FEB-24
Digital Multimeter	34461A	MY31203034	TEL-20 280266	13-FEB-24
Digital Multimeter	34461A	MY60034273	TEL-20 310266	14-FEB-24
Programmable Attenuator	MAT-1030	6210014	EF-0011-23	08-FEB-24
Condenser Microphone	4180	297900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42K/J	34560495	AA-5002-23	14-FEB-24

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

3. This certificate is acceptable to the international system of unit (SI) as follows:

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

## Continuation of Calibration Certificate

Cert. No.: ACL23325  
Job No.: VCB7AC001  
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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.2	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.2
8. Level linearity including the level range control	✓	-	0.2	0.2
9. Time burst response	✓	-	0.2	0.2
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.35
12. High level stability	✓	-	0.1	0.1

Note: Pass/Fail evaluation for each parameter,  
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No.: ACL23325  
Job No.: VCB7AC001  
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	18.8
Flat	24.6

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
8000	1.6	1.7	1.6	±5.0

QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No.: ACL23325  
Job No.: VCB7AC001  
Pages: 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

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

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz:

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

## 5.2 Time weighting at 1 kHz:

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

## 6. Long-term stability

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

QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No.: ACL23325  
Job No.: VCB7AC001  
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
29.0	28.9	-0.1	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1
4.0	3.9	-0.1	±1.1
-1.0	-1.0	0.0	±1.1
-6.0	-6.0	0.0	±1.1
-11.0	-11.0	0.0	±1.1
-16.0	-16.0	0.0	±1.1
-21.0	-21.0	0.0	±1.1
-26.0	-25.9	-0.1	±1.1
-31.0	-30.9	-0.1	±1.1
-36.0	-35.9	-0.1	±1.1
-41.0	-40.9	-0.1	±1.1
-46.0	-45.9	-0.1	±1.1
-51.0	-50.9	-0.1	±1.1
-56.0	-55.9	-0.1	±1.1
-61.0	-60.9	-0.1	±1.1
-66.0	-65.9	-0.1	±1.1
-71.0	-70.9	-0.1	±1.1
-76.0	-75.9	-0.1	±1.1
-81.0	-80.9	-0.1	±1.1
-86.0	-85.9	-0.1	±1.1
-91.0	-90.9	-0.1	±1.1
-96.0	-95.9	-0.1	±1.1
-101.0	-100.9	-0.1	±1.1
-106.0	-105.9	-0.1	±1.1
-111.0	-110.9	-0.1	±1.1
-116.0	-115.9	-0.1	±1.1
-121.0	-120.9	-0.1	±1.1
-126.0	-125.9	-0.1	±1.1
-131.0	-130.9	-0.1	±1.1
-136.0	-135.9	-0.1	±1.1
-141.0	-140.9	-0.1	±1.1
-146.0	-145.9	-0.1	±1.1
-151.0	-150.9	-0.1	±1.1
-156.0	-155.9	-0.1	±1.1
-161.0	-160.9	-0.1	±1.1
-166.0	-165.9	-0.1	±1.1
-171.0	-170.9	-0.1	±1.1
-176.0	-175.9	-0.1	±1.1
-181.0	-180.9	-0.1	±1.1
-186.0	-185.9	-0.1	±1.1
-191.0	-190.9	-0.1	±1.1
-196.0	-195.9	-0.1	±1.1
-201.0	-200.9	-0.1	±1.1
-206.0	-205.9	-0.1	±1.1
-211.0	-210.9	-0.1	±1.1
-216.0	-215.9	-0.1	±1.1
-221.0	-220.9	-0.1	±1.1
-226.0	-225.9	-0.1	±1.1
-231.0	-230.9	-0.1	±1.1
-236.0	-235.9	-0.1	±1.1
-241.0	-240.9	-0.1	±1.1
-246.0	-245.9	-0.1	±1.1
-251.0	-250.9	-0.1	±1.1
-256.0	-255.9	-0.1	±1.1
-261.0	-260.9	-0.1	±1.1
-266.0	-265.9	-0.1	±1.1
-271.0	-270.9	-0.1	±1.1
-276.0	-275.9	-0.1	±1.1
-281.0	-280.9	-0.1	±1.1
-286.0	-285.9	-0.1	±1.1
-291.0	-290.9	-0.1	±1.1
-296.0	-295.9	-0.1	±1.1
-301.0	-300.9	-0.1	±1.1
-306.0	-305.9	-0.1	±1.1
-311.0	-310.9	-0.1	±1.1
-316.0	-315.9	-0.1	±1.1
-321.0	-320.9	-0.1	±1.1
-326.0	-325.9	-0.1	±1.1
-331.0	-330.9	-0.1	±1.1
-336.0	-335.9	-0.1	±1.1
-341.0	-340.9	-0.1	±1.1
-346.0	-345.9	-0.1	±1.1
-351.0	-350.9	-0.1	±1.1
-356.0	-355.9	-0.1	±1.1
-361.0	-360.9	-0.1	±1.1
-366.0	-365.9	-0.1	±1.1
-371.0	-370.9	-0.1	±1.1
-376.0	-375.9	-0.1	±1.1
-381.0	-380.9	-0.1	±1.1
-386.0	-385.9	-0.1	±1.1
-391.0	-390.9	-0.1	±1.1
-396.0	-395.9	-0.1	±1.1
-401.0	-400.9	-0.1	±1.1
-406.0	-405.9	-0.1	±1.1
-411.0	-410.9	-0.1	±1.1
-416.0	-415.9	-0.1	±1.1
-421.0	-420.9	-0.1	±1.1
-426.0	-425.9	-0.1	±1.1
-431.0	-430.9	-0.1	±1.1
-436.0	-435.9	-0.1	±1.1
-441.0	-440.9	-0.1	±1.1
-446.0	-445.9	-0.1	±1.1
-451.0	-450.9	-0.1	±1.1
-456.0	-455.9	-0.1	±1.1
-461.0	-460.9	-0.1	±1.1
-466.0	-465.9	-0.1	±1.1
-471.0	-470.9	-0.1	±1.1
-476.0	-475.9	-0.1	±1.1
-481.0	-480.9	-0.1	±1.1
-486.0	-485.9	-0.1	±1.1
-491.0	-490.9	-0.1	±1.1
-496.0	-495.9	-0.1	±1.1
-501.0	-500.9	-0.1	±1.1
-506.0	-505.9	-0.1	±1.1
-511.0	-510.9	-0.1	±1.1
-516.0	-515.9	-0.1	±1.1
-521.0	-520.9	-0.1	±1.1
-526.0	-525.9	-0.1	±1.1
-531.0	-530.9	-0.1	±1.1
-536.0	-535.9	-0.1	±1.1
-541.0	-540.9	-0.1	±1.1
-546.0	-545.9	-0.1	±1.1
-551.0	-550.9	-0.1	±1.1
-556.0	-555.9	-0.1	±1.1
-561.0	-560.9	-0.1	±1.1
-566.0	-565.9	-0.1	±1.1
-571.0	-570.9	-0.1	±1.1
-576.0	-575.9	-0.1	±1.1
-581.0	-580.9	-0.1	±1.1
-586.0	-585.9	-0.1	±1.1
-591.0	-590.9	-0.1	±1.1
-596.0	-595.9	-0.1	±1.1
-601.0	-600.9	-0.1	±1.1
-606.0	-605.9	-0.1	±1.1
-611.0	-610.9	-0.1	±1.1
-616.0	-615.9	-0.1	±1.1
-621.0	-620.9	-0.1	±1.1
-626.0	-625.9	-0.1	±1.1
-631.0	-630.9	-0.1	±1.1
-636.0	-635.9	-0.1	±1.1
-641.0	-640.9	-0.1	±1.1
-646.0	-645.9	-0.1	±1.1
-651.0	-650.9	-0.1	±1.1
-656.0	-655.9	-0.1	±1.1
-661.0	-660.9	-0.1	±1.1
-666.0	-665.9	-0.1	±1.1
-671.0	-670.9	-0.1	±1.1
-676.0	-675.9	-0.1	±1.1
-681.0	-680.9	-0.1	±1.1
-686.0	-685.9	-0.1	±1.1
-691.0	-690.9	-0.1	±1.1
-696.0	-695.9	-0.1	±1.1
-701.0	-700.9	-0.1	±1.1
-706.0	-705.9	-0.1	±1.1
-711.0	-710.9	-0.1	±1.1
-716.0	-715.9	-0.1	±1.1
-721.0	-720.9	-0.1	±1.1
-726.0	-725.9	-0.1	±1.1
-731.0	-730.9	-0.1	±1.1
-736.0	-735.9	-0.1	±1.1
-741.0	-740.9	-0.1	±1.1
-746.0	-745.9	-0.1	±1.1
-751.0	-750.9	-0.1	±1.1
-756.0	-755.9	-0.1	±1.1
-761.0	-760.9	-0.1	±1.1
-766.0	-765.9	-0.1	±1.1
-771.0	-770.9	-0.1	±1.1
-776.0	-775.9	-0.1	±1.1
-781.0	-780.9	-0.1	±1.1
-786.0	-785.9	-0.1	±1.1
-791.0	-790.9	-0.1	±1.1
-796.0	-795.9	-0.1	±1.1
-801.0	-800.9	-0.1	±1.1
-806.0	-805.9	-0.1	±1.1
-811.0	-810.9	-0.1	±1.1
-816.0	-815.9	-0.1	±1.1
-821.0	-820.9	-0.1	±1.1
-826.0	-825.9	-0.1	±1.1
-831.0	-830.9	-0.1	±1.1
-836.0	-835.9	-0.1	±1.1
-841.0	-840.9	-0.1	±1.1
-846.0	-845.9	-0.1	±1.1
-851.0	-850.9	-0.1	±1.1
-856.0	-855.9	-0.1	±1.1
-861.0	-860.9	-0.1	±1.1
-866.0	-865.9	-0.1	±1.1
-871.0	-870.9	-0.1	±1.1
-876.0	-875.9	-0.1	±1.1
-881.0	-880.9	-0.1	±1.1
-886.0	-885.9	-0.1	±1.1
-891.0	-890.9	-0.1	±1.1
-896.0	-895.9	-0.1	±1.1
-901.0	-900.9	-0.1	±1.1
-906.0	-905.9	-0.1	±1.1
-911.0	-910.9	-0.1	±1.1
-916.0	-915.9	-0.1	±1.1
-921.0	-920.9	-0.1	±1.1
-926.0	-925.9	-0.1	±1.1
-931.0	-930.9	-0.1	±1.1
-936.0	-935.9	-0.1	±1.1
-941.0	-940.9	-0.1	±1.1
-946.0	-945.9	-0.1	±1.1
-951.0	-950.9	-0.1	±1.1
-956.0	-955.9	-0.1	±1.1
-961.0	-960.9	-0.1	±1.1
-966.0	-965.9	-0.1	±1.1
-971.0	-970.9	-0.1	±1.1
-976.0	-975.9	-0.1	±1.1
-981.0	-980.9	-0.1	±1.1
-986.0	-985.9	-0.1	±1.1
-991.0	-990.9	-0.1	±1.1
-996.0	-995.9	-0.1	±1.1
-1001.0	-1000.9	-0.1	±1.1
-1006.0	-1005.9	-0.1	±1.1
-1011.0	-1010.9	-0.1	±1.1
-1016.0	-1015.9	-0.1	±1.1
-1021.0	-1020.9	-0.1	±1.1
-1026.0	-1025.9	-0.1	±1.1
-1031.0	-1030.9	-0.1	±1.1
-1036.0	-1035.9	-0.1	±1.1
-1041.0	-1040.9	-0.1	±1.1
-1046.0	-1045.9	-0.1	±1.1
-1051.0	-1050.9	-0.1	±1.1
-1056.0	-1055.9	-0.1	±1.1
-1061.0	-1060.9	-0.1	±1.1
-1066.0	-1065.9	-0.1	±1.1
-1071.0	-1070.9	-0.1	±1.1
-1076.0	-1075.9	-0.1	±1.1
-1081.0	-1080.9	-0.1	±1.1
-1086.0	-1085.9	-0.1	±1.1
-1091.0	-1090.9	-0.1	±1.1
-1096.0	-1095.9	-0.1	±1.1
-1101.0	-1100.9	-0.1	±1.1
-1106.0	-1105.9	-0.1	±1.1
-1111.0	-1110.9	-0.1	±1.1
-1116.0	-1115.9	-0.1	±1.1
-1121.0	-1120.9	-0.1	±1.1
-1126.0	-1125.9	-0.1	±1.1
-1131.0	-1130.9	-0.1	±1.1
-1136.0	-1135.9	-0.1	±1.1
-1141.0	-1140.9	-0.1	±1.1
-1146.0	-1145.9	-0.1	±1.1
-1151.0	-1150.9	-0.1	±1.1
-1156.0	-1155.9	-0.1	±1.1
-1161.0	-1160.9	-0.1	±1.1
-1166.0	-1165.9	-0.1	±1.1
-1171.0	-1170.9	-0.1	±1.1
-1176.0	-1175.9	-0.1	±1.1
-1181.0	-1180.9	-0.1	±1.1
-1186.0	-1185.9	-0.1	±1.1
-1191.0	-1190.9	-0.1	±1.1
-1196.0	-1195.9	-0.1	±1.1
-1201.0	-1200.9	-0.1	±1.1
-1206.0	-1205.9	-0.1	±1.1
-1211.0	-1210.9	-0.1	±1.1
-1216.0	-1215.9	-0.1	±1.1
-1221.0	-1220.9	-0.1	±1.1
-1226.0	-1225.9	-0.1	±1.1
-1231.0	-1230.9	-0.1	±1.1
-1236.0	-1235.9	-0.1	±1.1
-1241.0	-1240.9	-0.1	±1.1
-1246.0	-1245.9	-0.1	±1.1
-1251.0	-1250.9	-0.1	±1.1
-1256.0	-1255.9	-0.1	±1.1
-1261.0	-1260.9	-0.1	±1.1
-1266.0	-1265.9	-0.1	±1.1
-1271.0	-1270.9	-0.1	±1.1
-1276.0	-1275.9	-0.1	±1.1
-1281.0	-1280.9	-0.1	±1.1
-1286.0	-1285.9	-0.1	±1.1
-1291.0	-1290.9	-0.1	±1.1
-1296.0	-1295.9	-0.1	±1.1
-1301.0	-1300.9	-0.1	±1.1
-1306.0	-1305.9	-0.1	±1.1
-1311.0	-1310.9	-0.1	±1.1
-1316.0	-1315.9	-0.1	±1.1
-1321.0	-1320.9	-0.1	±1.1
-1326.0	-1325.9	-0.1	±1.1
-1331.0	-133		



# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had been 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 instrument 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	MY0017076	EP-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EP-0019-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-IP-302066	13-FEB-24
Digital Multimeter	33461A	MY53220106	EEL-IP-302066	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-IP-310266	14-FEB-24
Programmable Attenuator	MAT-1070	82100114	EP-0011-23	08-FEB-24
Condenser Microphone	4188	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42CA1	34560495	AA-3002-23	14-FEB-24

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

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

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

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
Pages : 3 of 8

## Summary of Measurement Result :

Parameter	Uncertainty	Maximum permitted
	(dB)	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
5000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
Flat 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

## Result of calibration :

### 1. Absolute sensitivity

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

### 2. Self-generated noise

#### 2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A-weight	13.4
C-weight	19.9
Flat	25.3

### 3. Acoustical signal tests of frequency weightings

Mean 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	0.2	0.3	±1.3
1000	0.1	0.1	0.1	±1.0
5000	0.8	0.9	0.9	±0.9

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
Pages : 2 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	+2.0	
125	0.0	0.0	0.0	±1.1
250	0.0	0.0	0.0	±1.1
500	0.0	0.0	0.0	±1.1
1000	0.0	0.0	0.0	±1.1
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

### 5.1 Frequency weightings at 1 kHz

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

### 5.2 Time weightings at 1 kHz

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

## 6. Long-term stability

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

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
Pages : 4 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
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
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
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. Time burst response

Time Weighting	Time burst duration, T <sub>b</sub> (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
	500	850	124.0	124.0	0.0	±0.0
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	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±0.6
One	136.4	136.3	-0.1	±3.0

Number of cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±0.6
Positive half cycle	125.4	125.2	-0.2	±2.0
Negative half cycle	125.4	125.2	-0.2	±2.0

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24007  
Job No. : VC67AC0044  
Pages : 5 of 8

## 11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive	Negative		
one-half cycle	one-half cycle	0.1	±1.5
19.5	19.6	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 by any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24008  
Job No. : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier N0-24  
Serial No. : 01177610 / 143485 / 23419  
ID No. : RYJGJ50388

Condition As Found : GOOD

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

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

Received Date : 19 DECEMBER 2023  
Calibration Date : 06-JANUARY 2024  
Date of Issue : 06 JANUARY 2024

Calibrated by : Natchanon Pongpikul

Approved by :  
( Thakul Petchum )

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

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403 Siemreang Road, Bangkum, Bangkok, 10150 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24008  
Job No. : VC67AC0044  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had been 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 instrument 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	MY0017076	EP-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EP-0019-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-IP-302066	13-FEB-24
Digital Multimeter	33461A	MY53220106	EEL-IP-302066	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-IP-310266	14-FEB-24
Programmable Attenuator	MAT-1070	82100114	EP-0011-23	08-FEB-24
Condenser Microphone	4188	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42CA1	34560495	AA-3002-23	14-FEB-24

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

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

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



# Summary of Measurement Result

Parameter	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	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 covered	0.2	0.3
9. Time burst response	0.2	0.3
10. Peak C sound level	0.2	0.3
11. Overload indication	0.2	0.3
12. High level stability	0.1	0.1

# Result of calibration

## 1. Absolute sensitivity

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

## 2. Self-generated noise

### 2.1 Normal test

Measured Value (dB)
18.6

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

Frequency Weighting	Measured value (dB)
A-weight	16.2
C-weight	22.1
Flat	28.0

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.5	0.5	0.6	± 5.0

# 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
40	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

# 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

# 6. Long-term stability

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

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

# SITHIPORN ASSOCIATES CALIBRATION LABORATORY

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

# SITHIPORN ASSOCIATES CALIBRATION LABORATORY

# SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

# SITHIPORN ASSOCIATES CALIBRATION LABORATORY

# 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
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	0.1	± 1.1
84.0	84.0	0.1	± 1.1
79.0	79.0	0.1	± 1.1
74.0	74.0	0.1	± 1.1
69.0	69.0	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.1	± 1.1
29.0	29.0	0.1	± 1.1
24.0	24.0	0.1	± 1.1
19.0	19.0	0.1	± 1.1
14.0	14.0	0.1	± 1.1
9.0	9.0	0.1	± 1.1
4.0	4.0	0.1	± 1.1

# 8. Level linearity including the level range covered

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

# 9. Time burst response

Time Weighting	Time burst duration, T <sub>b</sub> (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
	7	8	117.0	117.0	0.0	1.0; -2.5
	700	800	124.0	124.0	0.0	± 1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.5	-0.1	± 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 (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	± 3.0
One	136.4	135.7	-0.7	± 3.0

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

# 11. Overload indication

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. T-47-00232 MTC No. TEL. RF. 171.0167

**CALIBRATION CERTIFICATE**

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
Address: 104 Phatthanasarak 40, Phatthanasarak Rd., Khlong Phatthanasarak, Khet Suan Luang, Bangkok 10250.  
Calibrated at: Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,  
Sri HC, Bangpoo Industrial Estate, Sukhumvit Rd., A-Muang, Samutprakan 10280.

Instrument Calibrated: Ambient Environment  
Description: Sound Level Meter  
Manufacturer: Rion  
Model: NR-42  
Serial No.: 00296318 (ID: RYG, P80413)  
Microphone: Type UC-52 No.66239  
Pre-amplifier: Type NH-24 No.34375

Standards used:  
1. Basic Pwr Filter Waveform 752A S/N 90010494.  
2. Condenser Microphone Brüel&Kjær 4180 S/N 2389671  
3. Decade Attenuator Ando AI-285 S/N 9046402.  
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY404268.  
5. Digital Function Synthesizer NF Electronic Instruments DP-10A S/N 123837.  
6. Digital Multimeter Fluke 850A S/N 4059807.  
7. Phonohead Rion NC-72 S/N 0040246.  
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1532484.

Date of Receipt: 24 Jan. 2024  
Date of Calibration: 22-28 Feb. 2024

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. T-47-00232 MTC No. TEL. RF. 171.0167

9. Power Amplifier Brüel&Kjær 2706 S/N 151765;  
10. Speaker Tammy Limited, Great Britain British Patent No. 215300.  
11. Digital Multimeter Agilent 34401A S/N MY4005560  
12. Programmable Acoustic Tanswaver TPA-103A S/N 2212.

Calibration Procedure:  
This instrument was calibrated by using calibration procedures on CP-102-02 and CP-102-03, which were based on IEC 61673-3 (Fluorescence) - Sound Level Meters - Part 3 - Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal test. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration: 22-28 Feb. 2024

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. T-47-00232 MTC No. TEL. RF. 171.0167

**1. Absolute Sensitivity**

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation value (dB)	Acceptance Limit Class 2 (dB)	Uncertainty of measurement (dB)	Maximum-permitted uncertainty of measurement (dB)
133.96	133.9	-13.9	1.0	0.30	N/A

Note: The external calibration adjustment was freshly performed. The internal calibration adjustment was then completed at the display of 123.1 dB.

**2. Self-generated noise**

**2.1 Normal test**

Measured value (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
20.2	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
A-weight	14.4	0.10	N/A
C-weight	19.9	0.10	N/A
Flat	25.3	0.10	N/A

Date of Calibration: 22-28 Feb. 2024



### 3. Acoustic signal test of frequency weightings

Frequency (Hz)	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
125	-0.1	0.2	0.1	1.5	0.6
1000	0.0	0.0	0.0	1.0	0.6
8000	-1.7	-1.7	-1.7	5.0	0.45

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
63	-0.1	-0.1	-0.1	2.0	0.6
125	-0.1	0.0	0.0	1.5	0.20
250	-0.1	0.0	0.0	1.5	0.20
500	-0.1	0.0	0.0	1.5	0.20
1000	0.0	0.0	0.0	1.0	0.20
2000	-0.1	0.0	-0.1	2.0	0.20
4000	-0.1	0.0	0.0	3.0	0.20
8000	0.0	0.0	0.0	5.0	0.20

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

### 7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	43.9	-0.1	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
24	23.9	-0.1	1.1	0.30	0.3
19	18.9	-0.1	1.1	0.30	0.3
14	13.9	-0.1	1.1	0.30	0.3
9	8.9	-0.1	1.1	0.30	0.3
4	3.9	-0.1	1.1	0.30	0.3

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

Range	Anticipated value (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
113.96	114.1	0.1	1.0	0.30	N/A

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
Address : 104 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Instrument Calibration :  
Description : Sound Level Meter  
Manufacturer : Rion  
Model : NL-42  
Serial No. : 0026515 (ID: RYG, F80432)  
Microphone : Type UC-52 Na.179119  
Pre-amplifier : Type NH-24 Na.87526

- Standards used :
1. Band Pass Filter Wavelet 752A S/N 9010044.
  2. Condenser Microphone Brüel&Kjær 4180 S/N 2809871
  3. Decade Attenuator Ando AI-205 S/N 0604602.
  4. Function/Arbitrary Waveform Generator Agilent 33220A S/N M404268.
  5. Digital Frequency Synthesizer NF Electronics Instruments DI-193A S/N 123037.
  6. Digital Multimeter Fluke 850A S/N 408587.
  7. Pinpointing Rion NO-72 S/N 0940248.
  8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Calibration : 24 Jan. 2024

Date of Receipt : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

### 5. Long-term stability

Time	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0	0.0	0.3	0.10	0.1

### 6. Frequency and time weightings at 1 kHz

Frequency	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Weighting	94.0	0.0	0.2	0.20	0.2
Time	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

### 6.2 Time weightings at 1 kHz

Frequency	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Weighting	94.0	0.0	0.1	0.20	0.2
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

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

Range	Anticipated value (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
30-130	25	25.0	0.0	1.1	0.30	0.3

### 9. Time burst response

Time	Threshold Duration, Tm (ms)	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Weighting	200	126.0	0.0	-2.0	0.20	0.3
Fast	2	108.9	-0.1	+1.0, -2.5	0.20	0.3
	0.25	100.0	0.0	+1.5, -5.0	0.20	0.3
Slow	200	119.5	-0.1	-2.0	0.20	0.3
	2	100.0	0.0	+1.0, -5.0	0.20	0.3

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

9. Power Amplifier Brüel&Kjær 2706 S/N 1511650.
10. Speaker Tansony Limited, Great Britain Patent No. 215500.
11. Digital Multimeter Agilent 34401A S/N MY4005906.
12. Programmable Attenuator Tampopac TPA-103A S/N 2212.

### Calibration Procedures :

This instrument was calibrated by using calibration procedures on CP-102-01 and CP-102-03, which were based on IEC 61673-3 Electroacoustic - Sound Level Meters - Part 3: Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal test. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

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

Anticipated value (dB)	Measured Value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
137	137.0	0.0	1.1	0.30	0.3
136	136.0	0.0	1.1	0.30	0.3
135	135.0	0.0	1.1	0.30	0.3
133	133.0	0.0	1.1	0.30	0.3
132	132.0	0.0	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

1/9

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity of the results except as full and permitted current unless otherwise indicated from the signature of TSI.

Head Office  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office Laboratory  
35/34 3 Taniwan Wiling Rd, Amphur Wang Lueang,  
Changwat Pathumthani 12130, Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

Office  
181 Phatthana Road, Chomchong, Bangkok 10000,  
Thailand  
Tel: 080-027-7000  
Fax: 080-027-7000  
E-mail: tsicert@tsi.or.th

### 18. Peak C sound level

Number of cycles at test signal	Anticipated value (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Complete cycle	125.4	125.5	0.1	1.0	0.26	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.26	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.26	0.35

### 11. Overload indication

Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Positive one-half cycle	125.4	0.0	1.5	0.55
Negative one-half cycle	125.4	0.0	1.5	0.55

### 12. High-level stability

Time	Measured value (dB)	Deviation value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0	0.0	0.3	0.10	0.1

Calibrated by :   
(Mr. Pannat Phangrui)

Approved by :   
Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre  
Ref: 201 (2679)18403(470)

Date of Calibration : 22-28 Feb. 2024  
Date of Issue : 29 Feb. 2024

Date of Receipt : 22-28 Feb. 2024

The results relate only to the items tested/calibrated as stated above.  
Adopting the Report Certificate and validity







### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Desired value (dB)	Measured value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
125	0.0	0.2	0.1	1.5	0.6
1000	0.0	0.0	0.0	1.0	0.4
8000	-0.1	-0.1	-0.1	1.0	0.4

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Desired value (dB)	Measured value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
63	-0.1	0.0	0.0	2.0	0.6
125	-0.1	0.0	0.0	1.5	0.6
250	0.0	0.0	0.0	1.5	0.6
500	0.0	0.0	0.0	1.5	0.6
1000	0.0	0.0	0.0	1.0	0.6
2000	0.0	0.0	0.0	2.0	0.6
4000	0.0	0.0	0.0	2.0	0.6
8000	0.0	0.0	0.0	2.0	0.7

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

### 5. Long-term stability

Time	Measured Value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0	0.0	0.3	0.10	0.1

### 6. Frequency and time weightings at 1 kHz

Frequency (Hz)	Measured Value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Weighting	94.0	0.0	0.2	0.20	0.2
Fast	94.0	0.0	0.2	0.20	0.2
Slow	94.0	0.0	0.2	0.20	0.2

### 6.2 Time weightings at 1 kHz

Frequency (Hz)	Measured Value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Flat	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

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

Anticipated value (dB)	Measured Value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
137	137.1	0.1	1.1	0.30	0.3
136	136.1	0.1	1.1	0.30	0.3
135	135.1	0.1	1.1	0.30	0.3
133	133.1	0.1	1.1	0.30	0.3
132	132.1	0.1	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.1	0.1	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

### 7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured Value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
24	24.0	0.0	-1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.8	-0.2	1.1	0.30	0.3
24	23.8	-0.2	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.8	-0.2	1.1	0.30	0.3

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

Range	Anticipated value (dB)	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

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

Range	Anticipated value (dB)	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
30-130	25	25.0	0.0	1.1	0.30	0.3

### 9. Time burst response

Time Weighting	Duration, (ms)	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Fast	200	108.9	-0.1	+1.0, -2.5	0.20	0.3
	0.25	108.0	0.0	+1.5, -5.0	0.20	0.3
Slow	200	119.5	-0.1	+1.0, -5.0	0.20	0.3
	2	100.0	0.0	+1.0, -5.0	0.20	0.3

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

### 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Complete cycle	125.4	125.5	0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

### 11. Overload indication

Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Positive one-half cycle	135.4	0.0	1.5	0.55
Negative one-half cycle	135.4	0.0	1.5	0.55

### 12. High-level stability

Time	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0	0.0	0.3	0.10	0.1

Calibrated by :  Approved by : 

(Mr. Pannat Phangorn)  
Date of Calibration : 22-28 Feb. 2024  
Date of Issue : 29 Feb. 2024  
Ref. : 201/247012480-7003

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

### CALIBRATION CERTIFICATE

Subsidiary : AUL Laboratory Group (Thailand) Co., Ltd.  
Address : 104 Phraetongkarn 40, Phraetongkarn Rd., Khwaeng Phraetongkarn, Khet San Luang, Bangkok 10250.  
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre, Soi 10, (Bangkok Industrial Estate, Sukhumvit Rd., A-Mong, Sametprakan, 10280.  
Instrument Calibrated :  
Description : Sound Level Meter  
Manufacturer : Rion  
Model : NL-42  
Serial No. : 00296577 (ID: RYG-FS0434)  
Microphone : Type UC-52 No. 13520  
Preamplifier : Type NH-24 No. 87527

- Standards used :
1. Band Pass Filter Wavetek 752A S/N 90010494.
  2. Condenser Microphone Brüel&Kjær 4130 S/N 2888871
  3. Decade Attenuator Andri-A-205 S/N 0604802.
  4. Function/Arbitrary Waveform Generator Agilent 33250A S/N MY400466.
  5. Digital Function Synthesizer NF Electronic Instruments (DF) 910A S/N 123137.
  6. Digital Multimeter Fluke 1508A S/N 4050807.
  7. Precision Resistor Res-NC-72 S/N 0940244.
  8. Measuring Amplifier Brüel&Kjær 2636 S/N 1357484.

Date of Receipt : 24 Jan. 2024  
Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

9. Power Amplifier Brüel&Kjær 2706 S/N 1511650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215360.
11. Digital Multimeter Agilent 34401A S/N MY4005560.
12. Precision Attenuator Tannogawa TPA-30A S/N 2212.

Calibration Procedure :  
This instrument was calibrated by using calibration procedures on CP-102-02 and CP-102-03, which were based on IEC 61675-3 Electroacoustics - Sound Level Meters - Part 3: Portable units (2013). These calibration procedures were related to the electrical and acoustic signal test. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.  
This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (NIM).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.  
The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Calibration : 22-28 Feb. 2024

The results relate only to the items described/indicated or value assigned. Adhering the Request Certificate and quality of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office Laboratory : 25/4-5 Santhorn-Wongkha, Amphur Wongkha, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

Office : 18 Phrasaeng Road, Chulachalongkrajong, Bangkok 10300, Thailand  
Tel. 080-257-9000  
Fax. 080-257-9000  
E-mail : tistr@tistr.go.th

### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)	Desired value (dB)	Acceptance limit (class 2) (dB)	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
113.96	114.3	113.9	-0.1	1.0	0.20

Note: The external calibration adjustment was finely performed. The internal calibration adjustment was then completed at the display of 123.9 dB.

### 2. Self-generated noise







Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP201.2 S/N: 1302348.  
Dimension: Diameter 3.3 mm, Length 120 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.05	20.0	-0.1	0.009
80	21.04	21.0	-0.0	0.009
80	30.04	30.0	-0.0	0.009
80	35.04	35.0	-0.0	0.009
80	40.04	40.0	-0.0	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP201.2 S/N: 1301545.  
Dimension: Diameter 3.3 mm, Length 120 mm.

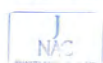
Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.05	20.0	-0.0	0.009
110	21.04	21.0	-0.0	0.009
110	30.04	30.0	-0.0	0.009
110	35.04	35.0	-0.0	0.009
110	40.04	40.0	-0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP201.2 S/N: 1301545.  
Dimension: Diameter 14 mm, Length 120 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.05	20.0	-0.0	0.009
75	21.04	21.0	-0.0	0.009
75	30.04	30.0	-0.0	0.009
75	35.04	35.0	-0.0	0.009
75	40.04	40.0	-0.0	0.009

USC: Under Calibration

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



## CERTIFICATE OF CALIBRATION

Certificate No.: COT-034-67

Page 1 of 2 Pages

MEASUREMENT ITEM

1. Heat Stress Monitor  
Model/Type: H032.2  
Serial Number: 1300770  
ID Number: HPL201.2  
Condition as received: Good  
Customer: ACS Laboratory group (Shanghai) Co., Ltd.  
204 Phatthanasak Rd., Phatthanasak Rd.,  
Bangkok 10250 Thailand.

RECEIVED DATE

13 Jan 2024

MEASUREMENT DATE

13 Jan 2024

ISSUE DATE

13 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory is as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 45.0 ± 1.0 %RH

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

TABULATION OF RESULTS:

The table on next page gives the measured values.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.05	20.0	-0.0	0.009
75	21.04	21.0	-0.0	0.009
75	30.04	30.0	-0.0	0.009
75	35.04	35.0	-0.0	0.009
75	40.04	40.0	-0.0	0.009

Calibrated by:

Mr. Panyam Boonchuan

Checked by:

Mr. Panyam Boonchuan

Approved signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Signature:

Mr. Panyam Boonchuan

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP201.2 S/N: 1302348.  
Dimension: Diameter 3.3 mm, Length 120 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.05	20.0	-0.1	0.009
80	21.04	21.0	-0.0	0.009
80	30.04	30.0	-0.0	0.009
80	35.04	35.0	-0.0	0.009
80	40.04	40.0	-0.0	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP201.2 S/N: 1301545.  
Dimension: Diameter 3.3 mm, Length 120 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.05	20.0	-0.0	0.009
110	21.04	21.0	-0.0	0.009
110	30.04	30.0	-0.0	0.009
110	35.04	35.0	-0.0	0.009
110	40.04	40.0	-0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP201.2 S/N: 1301545.  
Dimension: Diameter 14 mm, Length 120 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.05	20.0	-0.0	0.009
75	21.04	21.0	-0.0	0.009
75	30.04	30.0	-0.0	0.009
75	35.04	35.0	-0.0	0.009
75	40.04	40.0	-0.0	0.009







Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 45 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP301.2 S/N: 20030506.  
Dimension: Diameter 3.1 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.528	20.1	0.0	0.009
80	25.047	25.1	0.1	0.009
80	30.042	30.1	0.1	0.009
80	35.035	35.1	0.1	0.009
80	40.025	40.1	0.1	0.009

Table 2: This equipment was connected with Glider thermometer probe Model: TP301.2 S/N: 1718084.  
Dimension: Diameter 3.1 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.058	20.0	-0.1	0.009
110	25.047	25.0	0.0	0.009
110	30.042	30.0	0.0	0.009
110	35.045	35.0	-0.1	0.009
110	40.025	40.0	-0.1	0.009

Table 3: This equipment was connected with temperature probe Model: TP301.2 S/N: 18033233.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.1	0.0	0.009
75	25.047	25.0	-0.1	0.009
75	30.042	30.0	-0.1	0.009
75	35.035	35.0	-0.1	0.009
75	40.025	39.9	-0.1	0.009

UUC: Uncertainty Calibration  
Report: The reported uncertainty of measurement is 0.36, 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.: COT-038-07

MEASUREMENT ITEM  
MANUFACTURER  
MODEL/TYPE  
SERIAL NUMBER  
ID NUMBER  
CONDITION AS RECEIVED  
CUSTOMER

1. Wet Bulb Moisture  
- Value: 20.528  
- Model: HP301.2  
- Serial: 20030506  
- ID: 170304  
- Condition: As Received  
- Customer: JNAC Laboratory group (Thailand) Co., Ltd.  
- Address: 104 Phatthana Raj Road, Phatthana Raj, Bangkok 10110 Thailand.

RECEIVED DATE: 11 Jan 2024  
MEASUREMENT DATE: 12 Jan 2024  
ISSUE DATE: 17 Jan 2024

ENVIRONMENTAL CONDITIONS:  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.6 ± 1.5 %

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

TABULATION OF RESULTS:  
The table on next page give the measured values.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.1	0.0	0.009
75	25.047	25.0	-0.1	0.009
75	30.042	30.0	-0.1	0.009
75	35.035	35.0	-0.1	0.009
75	40.025	39.9	-0.1	0.009

Calibrated by: J NAC  
Checked by: J NAC  
Approved by: J NAC

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 45 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP301.2 S/N: 18032468.  
Dimension: Diameter 3.1 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.528	20.0	-0.1	0.009
80	25.045	25.0	-0.1	0.009
80	30.040	30.0	-0.1	0.009
80	35.029	35.0	-0.1	0.009
80	40.030	40.0	0.0	0.009

Table 2: This equipment was connected with Glider thermometer probe Model: TP301.2 S/N: 18030689.  
Dimension: Diameter 3.1 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.0	0.0	0.014
110	25.043	25.0	-0.1	0.014
110	30.040	30.0	-0.1	0.014
110	35.039	35.0	-0.1	0.014
110	40.030	40.0	0.0	0.014

Table 3: This equipment was connected with temperature probe Model: TP301.2 S/N: 18031128.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.2	0.1	0.007
75	25.042	25.0	-0.1	0.009
75	30.042	30.0	-0.1	0.009
75	35.036	34.9	-0.1	0.009
75	40.030	39.9	-0.1	0.009

UUC: Uncertainty Calibration  
Report: The reported uncertainty of measurement is 0.35, based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

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



Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP301.2 S/N: 1803167.  
Dimension: Diameter 3.1 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.528	20.1	0.1	0.009
80	25.052	25.1	0.0	0.009
80	30.045	30.0	-0.1	0.009
80	35.036	35.1	0.1	0.009
80	40.030	40.0	0.0	0.009

Table 2: This equipment was connected with Glider thermometer probe Model: TP301.2 S/N: 1803087.  
Dimension: Diameter 3.1 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.058	20.1	0.1	0.009
110	25.052	25.0	-0.1	0.009
110	30.045	30.0	-0.1	0.009
110	35.036	35.1	0.1	0.009
110	40.030	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP301.2 S/N: 18032370.  
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.2	0.2	0.009
75	25.052	25.1	0.0	0.009
75	30.045	30.0	-0.1	0.009
75	35.036	35.0	-0.1	0.009
75	40.030	39.9	-0.1	0.009

UUC: Uncertainty Calibration

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



## Certificate of Testing

Equipment: DO Meter  
Manufacturer: YSI  
Model: 5000-115V  
Serial No.: 15E102796  
ID No.: RYC-EN0032  
Received Date: 21 July 2023  
Test Date: 24 July 2023  
Reference: 2307-01305C-1  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
Rajong Branch  
616/10 Moo 5, T.Maanam Khui, A.Phuakding, Rayong 21140, Thailand  
Laboratory Condition: Temperature (25 ± 5) °C  
Humidity (50 ± 20) %  
Test Procedure: In-house method: CP-018  
by Comparison Technique with Acids Modification Method  
Tested by: Watsak Sirichon  
Approved by:   
Approved Signatory

( ) Above Business  
( ) Sathip Meangrai  
( ) Watsak Lomgpradit

Issue Date: 28 July 2023

0320211

**Condition of this result of calibration**

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	130B010	23C01172	22 Mar 2023	
2) Balance	1126143764	140R0304	22 Mar 2023	

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

Result: Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 15E100464

Titration Method (Acids Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
0.18	0.17	0.005

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 or in full without written approval of the laboratory.

031172155

**Certificate of Calibration**

Equipment: DO Meter with Sensor  
Manufacturer: YSI  
Model: 5000-115V  
Serial No.: 15E102796  
ID No.: RYC-EN0032  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
Rayong Branch  
616/10 Moo 5, T.Maanam Khui, A.Phuakding, Rayong 21140, Thailand  
TPA On Site Calibration Laboratory  
Location:  
Received Order: 25 July 2023  
Calibrated Date: 27 July 2023  
Ambient Temperature: (26 ± 1) °C  
Relative Humidity: (90 ± 5) %  
AC Line Voltage: (220 ± 2) V  
Calibrated by: Preecha Hahin  
Approved by:   
Approved Signatory  
Issue Date: 31 July 2023

The Uncertainties are for a confidence probability of approximately 95%  
This certificate was not reproduced other than in full, except with the prior written approval of the Institute of Corporate Services 3: Equipment Calibration and Testing Services.

0053616

**Equipment:** DO Meter with Sensor  
**Condition As-Received:** Used Item  
**Reference:** 2307-01305C-2  
**Procedure Used:** Calibration were conducted using in-house calibration procedure CP-0701 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.  
The temperature scale used was based on ITS-90.  
**Condition of this result of calibration:**  
1. Reference Standard Instruments:  
Instrument: Serial No.: Cert No.: Traceable: Due Date:  
1) Digital Thermometer: 2180800: 221205: TPA: 21 Oct 2023  
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.  
**Remark:** TPA: Technology Promotion Association (Thailand - Japan)  
**Result of Calibration:** ( ) Without Adjustment  
**Function:** Temperature measurement.  
This instrument was connected with: Industrial Platinum Resistance Thermometer: R12: 120M47367  
Calibration Point: Immersion Depth: Standard Temperature: UUC Reading: Error: Uncertainty: Coverage Factor:  
(°C) (mm) (°C) (°C) (°C) (%)  
20.00 100 20.011 19.91 -0.001 0.15 2.00  
UUC: Uncertainty 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%.

03115915



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
181/101 MAHAJITRA ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250  
TEL: 02-2717-3009-29 FAX: 02-2717-3040

Cert. No.: 237M302  
Page: 1 of 3

### Certificate of Calibration

Equipment: Low Temp. Incubator  
Manufacturer: Mamort  
Model: RPP750  
Serial No.: V818-0084  
ID No.: RYG\_EN0154  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
(Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong 21140 Thailand  
Location: BOD Room  
Received Order: 29 May 2023  
Calibration Date: 29 May 2023  
Ambient Temperature: (26 ± 1) °C  
Relative Humidity: (50 ± 3) %  
Calibrated by: Man Pattanaspongsook  
Approved by: [Signature]  
( ) Pornthippa Tameyakul  
( ) Unnaphong Harsachai  
( ) Suwit Injai  
Issue Date: 7 June 2023

REVIEW BY: [Signature]  
APPROVED BY: [Signature]  
NEXT CAL. DATE: 29/05/24

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0054957

Equipment: Low Temp. Incubator  
Condition As-Received: Used Item  
Reference: 2305-0980C-2  
Procedure Used: Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.  
Condition of this result of calibration  
1. Reference standard instrument: Model: 34972A Serial No.: MY5013711 Cert. No.: 221M83 Expiry Date: 02 Jul 2023  
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

Environment during calibration  
Temp. (°C): 23 23  
REL.Humid. (%): 54 58  
AC Supply (Volt): 223 222

Probe Installation Details: Dimension of Chamber:  
a = 10 cm D = 0.60 m  
b = 10 cm W = 1.0 m  
c = 10 cm H = 1.2 m  
Capacity = 0.75 m³

Position: Ref. Std. ID No.:  
1 18-18RTD-01  
2 18-18RTD-02  
3 18-18RTD-03  
4 18-18RTD-04  
5 18-18RTD-05  
6 18-18RTD-10  
7 18-18RTD-07  
8 22-18RTD-08  
9 (ref.) 18-18RTD-09

Probe Installation Details: Dimension of Chamber:  
a = 10 cm D = 0.60 m  
b = 10 cm W = 1.0 m  
c = 10 cm H = 1.2 m  
Capacity = 0.75 m³

A 1165130

Equipment: Low Temp. Incubator  
Condition As-Received: Used Item  
Reference: 2305-0980C-2  
Result of Calibration: ( ) Without Adjustment  
Function of UUC: Temperature Source  
Fresh air setting: Close

Calibration Point (°C): 20.0 19.547 19.700 19.487 19.529 19.428 20.130 20.112 20.400 20.116  
Setting (°C): 20.0 19.5 20.0 19.5 20.0 19.5 20.0 20.0 20.0 20.0  
Reading (°C): 20.0 19.547 19.700 19.487 19.529 19.428 20.130 20.112 20.400 20.116  
Temperature stability (± °C): 0.010  
Temperature uniformity (± °C): 0.14  
Overall Variation: 1.5  
Coverage Factor: 2

Calibration Point (°C): 20.0 19.547 19.700 19.487 19.529 19.428 20.130 20.112 20.400 20.116  
Setting (°C): 20.0 19.5 20.0 19.5 20.0 19.5 20.0 20.0 20.0 20.0  
Reading (°C): 20.0 19.547 19.700 19.487 19.529 19.428 20.130 20.112 20.400 20.116  
Temperature stability (± °C): 0.010  
Temperature uniformity (± °C): 0.14  
Overall Variation: 1.5  
Coverage Factor: 2

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 %.

-06-

A 1165129

Sartorius (Thailand) Co., Ltd.  
101 Rama 9 Road, Huaykong, Huaykong, Bangkok 10110  
Tel: +66 2643 8981-6, e-mail: service.thailand@sartorius.com

Cert. No.: 24TM034  
Page: 1 of 3

### Certificate of Calibration

Model Number: MSE224S-100-DU  
Description: Analytical Balance  
Serial Number: 0020207038  
ID No.: RYG\_EN0002  
Manufacturer: Sartorius  
Customer Name: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand  
Calibrated Place: ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)  
616/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand  
Calibrated by: Mr. Chanchai Inthas  
Calibration Date: Thursday, February 22, 2024  
Calibration Procedure No.: This calibration was conducted by using in-house calibration procedure number (W-003) Based on UKAS LAB 14: 2019  
Metrological data:  
Capacity: 220 g Readability: 0.0001 g  
Reasons for calibration:  
☒ New installation ☒ Service / Repair ☒ Recalibration / Maintenance

REVIEW BY: [Signature]  
APPROVED BY: [Signature]  
NEXT CAL. DATE: 23/03/25

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Sartorius (Thailand) Co., Ltd.  
101 Rama 9 Road, Huaykong, Huaykong, Bangkok 10110  
Tel: +66 2643 8981-6, e-mail: service.thailand@sartorius.com

Cert. No.: 24TM033  
Page: 1 of 3

### Certificate of Calibration

Model Number: MSE224S-100-DU  
Description: Analytical Balance  
Serial Number: 0020207038  
ID No.: RYG\_EN0002  
Manufacturer: Sartorius  
Calibration Results: Without Adjustment

Repeatability  
The repeatability is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same test with a measurement series is passed repeatedly on the weighing pan in the same manner. The standard deviation (s) value is expressed as repeatability quantity.

Linearity  
The linearity is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same test with a measurement series is passed repeatedly on the weighing pan in the same manner. The standard deviation (s) value is expressed as linearity quantity.

End of Report

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
334/4 PATTANASONGSOOK ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250  
TEL: 02-2717-3009-29 FAX: 02-2717-3040

Cert. No.: 24TM034  
Page: 1 of 3

### Certificate of Calibration

Equipment: Hot Air Oven  
Manufacturer: Mamort  
Model: UF 110  
Serial No.: B423.0853  
ID No.: RYG\_EN0213  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong 21140 Thailand  
Location: Oven Room  
Received Order: 21 March 2024  
Calibration Date: 21 - 22 March 2024  
Ambient Temperature: (26 ± 1) °C  
Relative Humidity: (50 ± 3) %  
Calibrated by: Man Pattanaspongsook  
Approved by: [Signature]  
( ) Pornthippa Tameyakul  
( ) Unnaphong Harsachai  
( ) Suwit Injai  
Issue Date: 23 March 2024

REVIEW BY: [Signature]  
APPROVED BY: [Signature]  
NEXT CAL. DATE: 21/03/25

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2403-0630C-3  
Procedure Used: Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.  
The temperature scale used was based on ITS-90.  
Condition of this result of calibration  
1. Reference standard instrument: Model: MY5013711 Serial No.: 238M115 Cert. No.: TPA Due Date: 11 Jul 2024  
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.  
Remark: TPA: Technology Promotion Association (Thailand - Japan)  
Result of Calibration: ( ) Without Adjustment  
Function of UUC: Temperature Source  
Fresh air setting: Close

Environment during calibration  
Temp. (°C): 227 227  
REL.Humid. (%): 59 59  
AC Supply (Volt): 224 223

Position: (190) °C (194) °C  
1 15-18TC-01 19-18RTD-01  
2 18-18TC-02 18-18RTD-02  
3 18-18TC-03 18-18RTD-03  
4 18-18TC-04 18-18RTD-04  
5 18-18TC-05 18-18RTD-05  
6 18-18TC-06 23-18RTD-06  
7 18-18TC-07 18-18RTD-07  
8 18-18TC-08 22-18RTD-08  
9 (ref.) 18-18TC-09 18-18RTD-09

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 = 0.48 m  
Capacity = 0.11 m³

Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2403-0630C-3  
Result of Calibration: ( ) Without Adjustment  
Function of UUC: Temperature Source  
Fresh air setting: Close

Calibration Point (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Setting (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Reading (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Temperature stability (± °C): 0.005  
Temperature uniformity (± °C): 0.52  
Overall Variation: 0.90  
Coverage Factor: 2

Calibration Point (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Setting (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Reading (°C): 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0 104.0  
Temperature stability (± °C): 0.005  
Temperature uniformity (± °C): 0.52  
Overall Variation: 0.90  
Coverage Factor: 2

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 %.

-06-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
334/4 PATTANASONGSOOK ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250  
TEL: 02-2717-3009-29 FAX: 02-2717-3040

Cert. No.: 24TM035  
Page: 1 of 3

### Certificate of Calibration

Equipment: Water Bath  
Manufacturer: Mamort  
Model: VMB22  
Serial No.: LS13.0048  
ID No.: RYG\_EN0001  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong 21140, Thailand  
Location: Wet Chemistry Lab  
Received Order: 21 March 2024  
Calibration Date: 21 March 2024  
Ambient Temperature: (26 ± 1) °C  
Relative Humidity: (50 ± 3) %  
Calibrated by: Man Pattanaspongsook  
Approved by: [Signature]  
( ) Pornthippa Tameyakul  
( ) Unnaphong Harsachai  
( ) Suwit Injai  
Issue Date: 23 March 2024

REVIEW BY: [Signature]  
APPROVED BY: [Signature]  
NEXT CAL. DATE: 21/03/25

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2403-05630C-4

Cert. No.: 24TM35  
Page: 2 of 3

Procedure Used : Calibration was conducted using in-house calibration procedure CP-0104 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (PRT).

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:

Instrument: MY57013711 23LM15 TPA 11 Jul 2024

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.

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

Result of Calibration : ( ) Without Adjustment

Function of UUC : Temperature Source

Heat transfer medium used : Water

	Environmental (°C)	AC Voltage Supply (Vol)
Beginning of Calibration	25	222
Finished of Calibration	25	223

Position :	Ref. Std. ID No. :
1	4803088-001
2	4803088-002
3	4803088-003
4	4803088-004
5 (ref)	4803088-005

Front



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2403-05630C-4

Cert. No.: 24TM35  
Page: 3 of 3

Result of Calibration : ( ) Without Adjustment

Function of UUC : Temperature Source

Calibration point (°C)	UUC Setting (°C)	UUC Reading (°C)	Average Standard Reading (°C)	Uncertainty (± °C)
85.0	85.0	84.428	84.428	0.18

Calibration point (°C)	Uniformity (°C)	Stability (°C)	Coverage Factor k
85.0	0.19	0.11	2

Average : The average of 30 values in each position.

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

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

UUC : Unit Under Calibration

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

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

-0-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
1541 PATANAKARN ROAD BOX 18, SUKHUMVIT, BANGKOK 10110  
TEL: 0-2717-888-0 FAX: 0-2717-888-1



Cert. No.: 24CH08  
Page: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : SevenCompact 5220  
Serial No. : C104058403  
ID No. : RYD\_010183  
Condition As-Received : Used Item  
Received Date : 18 January 2024  
Calibration Date : 19 January 2024  
Reference : 2401-05705C-2  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rajong Branch)  
616/10 Moo 5, T.Moonon Khu, A.Phuakding, Rayong 21140, Thailand

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

Calibrated by : Watsorn Lemgrakul

Approved by :  
( ) Saitip Mangmool  
( ) Watsorn Lemgrakul  
( ) Porpan Pajom

Issue Date : 24 January 2024

This Calibration is 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 0062854



Cert. No.: 24CH08  
Page: 2 of 3

#### Condition of this calibration result

##### 1. Reference Standard Instrument

Instrument: 54330046 130RC116 23E282 27 Aug 2024  
2) Ref. Standard Thermometer 4802054 110RC044 23J05 26 July 2024

This certificate is traceable to the International System of Unit maintained through

- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANAB-ASQ National Accredited Board, Accredited No. AR-1833

Buffer Solution Manufacturer Lot No. Exp. Date  
pH 4.006 CPA chem 840102 27 Nov 2025  
pH 6.866 CPA chem 840104 02 Nov 2024  
pH 9.997 CPA chem 840105 02 Nov 2024

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

#### Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4.7, 10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
	pH	mV	mV	(mV)	k
pH Meter C104058403	4.000	177.48	177.4	0.056	2.00
	7.000	0.00	0.0	0.058	2.00
	10.000	-177.48	-177.5	0.058	2.00

Saitip

a 1198287



Cert. No.: 24CH08  
Page: 3 of 3

#### Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.01, 7.00, 10.01)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (pH)	Coverage factor k
pH Electrode S/N: 3225367	4.006	4.013	176.0	0.0054	2.07
	6.866	6.863	2.2	0.0064	2.00
	9.997	9.999	-174.1	0.0055	2.00

#### Function : Temperature Measurement

( ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 81410000000000000000

- Serial No. : 3225367

Dimension of probe

- Length : 120 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.2	0.199	0.13	2.00

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

-0-

Saitip

a 1198286



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
1541 PATANAKARN ROAD BOX 18, SUKHUMVIT, BANGKOK 10110  
TEL: 0-2717-888-0 FAX: 0-2717-888-1



Cert. No.: 24CH08  
Page: 1 of 2

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : SevenCompact 5220  
Serial No. : C104058403  
ID No. : RYD\_010183  
Condition As-Received : Used Item  
Received Date : 18 January 2024  
Calibration Date : 23 January 2024  
Reference : 2401-05705C-2  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rajong Branch)  
616/10 Moo 5, T.Moonon Khu, A.Phuakding, Rayong 21140, Thailand

Procedure used : Calibration was conducted using calibration procedure No. CP-E17 According to EURAMET up-15.

#### Condition of this result of calibration

##### 1. Reference standard instruments :

Instrument: Model Serial No. Certificate No. Due Date  
1) Multi-Product Calibrator 9508 823911 823911 29 May 2024

2) The result of calibration was made on requested at the point specified by customer.

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

4) This Certificate is traceable to the International System of Unit maintained through

-NA Calibration Co., Ltd., ANAB Accredited No. Calibration AC-2958

Calibrated by : Watsorn Lemgrakul Approved Signatory :  
Issue Date : 24 January 2024

( ) Pithayon Pradap  
( ) Watsorn Lemgrakul  
( ) Porpan Pajom

a 0332396



Cert. No.: 24E298  
Page: 2 of 2

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

Function: DC voltage measurement	Standard Value	UUC Reading	Range	Error	Uncertainty
	(mV)	(mV)		(mV)	(± μV)
	-200.0000	-200.0	2000	0.0	68
	-150.0000	-150.0		0.0	65
	-100.0000	-100.0		0.0	63
	-50.0000	-50.0		0.0	61
	0.0000	0.0		0.0	58
	50.0000	50.0		0.0	61
	100.0000	99.9		-0.1	63
	150.0000	149.9		-0.1	65
	200.0000	199.9		-0.1	68

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

UUC : Unit Under Calibration

-0-

a 1198963



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
1541 PATANAKARN ROAD BOX 18, SUKHUMVIT, BANGKOK 10110  
TEL: 0-2717-888-0 FAX: 0-2717-888-1

## Certificate of Calibration

Cert. No.: 24T778  
Page: 1 of 2

Equipment : Digital Thermometer  
Manufacturer : Testo  
Model : 106  
Serial No. : 83617700001  
ID No. : RYD\_010183  
Condition As-Received : Used Item  
Received Date : 29 March 2024  
Calibration Date : 23 April 2024  
Reference : 2403-10170C-3  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rajong Branch)  
616/10 Moo 5, T.Moonon Khu, A.Phuakding, Rayong 21140, Thailand

Procedure used : Calibration was conducted using in-house calibration procedure CP-101 according to comparison with Industrial Platinum Resistance Thermometer (PRT) into liquid bath temperature controller. The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Black Block Thermometer	560	8C454	238000	30 May 2024
2) Industrial PRT Probe	907A	07940	238000	30 May 2024

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 maintained through

-Technology Promotion Association (Thailand-Japan), NAC (NAC) Accredited No.

Calibration 0008

REVIEW BY : Pithayon Pradap

APPROVED BY : Saitip

NEXT CAL DATE : 23/04/25

Calibrated by : Anasit Pithayon  
Issue Date : 30 April 2024

Approved Signatory :  
( ) Pithayon Pradap  
( ) Chakchai Khongthak  
( ) Watsorn Lemgrakul







## Certificate of Calibration

Cert. No.: 247M332  
Page: 1 of 3

Equipment: Hot Air Oven  
Manufacturer: Mammoth  
Model: UFE 500  
Serial No.: G511.1572  
ID No.: RYO\_EN0070  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand  
Location: Oven Room  
Received Order: 21 March 2024  
Calibration Date: 21 March 2024  
Ambient Temperature: (26 ± 1) °C  
Relative Humidity: (50 ± 30) %  
Calibrated by: Man Pattanapongsakon  
Approved by: [Signature]  
( ) Pomthipha Teemasil  
( ) Unnaphol Hanachai  
( ) Suwit Injai  
Issue Date: 22 March 2024

The Uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 2: Equipment Calibration and Testing Services.



Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2403-05630C-1

Cert. No.: 247M332  
Page: 2 of 3

### Procedure Used

Calibration were conducted using calibration procedure CP-0102 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: Serial No. Cert. No. Traceable Due Date  
1) Data Acquisition MYS7013711 23LM11 TPA 11 Jul 2024

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

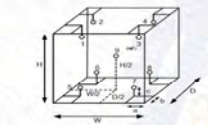
3. This certification is traceable to the International System of Unit.

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

Result of Calibration: ( ) Without Adjustment

Function of UUC: Temperature Source

Fresh air setting: Close



Probe Installation Details: Dimension of Chamber:  
a = 5.0 cm D = 0.40 m  
b = 5.0 cm W = 0.66 m  
c = 5.0 cm H = 0.48 m  
Capacity = 0.11 m<sup>3</sup>

Environment during calibration	
Temp. (°C)	Beginning Finished
REL Humid. (%)	57 59
AC Supply (Voh)	222 224

Ref. Std. ID No. (B) Calibration Point	
Position:	(100) °C (104) °C
1	18-18TC-01 18-18RTD-01
2	18-18TC-02 18-18RTD-02
3	18-18TC-03 18-18RTD-03
4	18-18TC-04 18-18RTD-04
5	18-18TC-05 18-18RTD-05
6	18-18TC-06 18-18RTD-06
7	18-18TC-07 18-18RTD-07
8	18-18TC-08 18-18RTD-08
9 (ref.)	18-18TC-09 18-18RTD-09



Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2403-05630C-1

Cert. No.: 247M332  
Page: 3 of 3

### Result of Calibration

Function of UUC: Temperature Source

Fresh air setting: Close

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (°C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
104.0	103.921	103.360	103.757	103.817	104.313	0.42
100.0	100.0	100.0	0.051	0.59	0.62	2
100.0	100.0	100.0	0.15	1.3	1.7	2

Calibration Point		Measured Temperature (°C)									Uncertainty
		1	2	3	4	5	6	7	8	9 (ref.)	(°C)
104.0		103.921	103.360	103.757	103.759	103.950	103.817	104.313	103.672	103.673	0.42
100.0		179.614	179.270	179.145	179.595	180.021	180.420	180.293	180.629	179.429	1.1

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.

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 %.



## Certificate of Calibration

Represent to Certificate of Calibration No. C29240017

Equipment: Block Digestion Unit  
Model: KT-20s  
Serial No. (or ID.): 5720210009/5770200073  
Manufacturer: Gerhardt  
Condition: In Condition  
Digestion Block: 20 holes.

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

Environment Condition: Temperature: 25 °C ± 0.7 °C  
Humidity: 54 %RH ± 4.1 %RH  
Voltage: 220 VAC ± 1.7 VAC

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

Calibration By: Mr. Thanathorn Phunook  
Calibration Date: 11 March 2024  
The Method used: In house method, base on by comparison with standard  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NLT.)  
Certificate No.: TC2220080

(Mr. Thanathorn Phunook)  
Person in charge  
(Mr. Joon Srichana)  
Authorized signatory

This certificate is issued for the units of measurement according to the International System of Units (SI). It provides evidence 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 % is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

Unit: Room and Unit info  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
Phone: +66 203 7100 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

Delivering Growth - in Asia and Beyond.

CAL/PH-C29-07: 26 Jul 2022

Certificate No.: C29240011

Page: 2 of 4

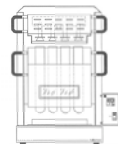
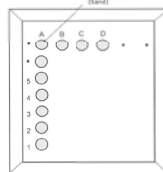


Fig. 1: Front view



Location of standard

Fig. 2: Digestion block

### Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the Digestion block.

Measured Temperature: The average reading of working standard at any positions or location.

Unit: Room and Unit info  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
Phone: +66 203 7100 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

Delivering Growth - in Asia and Beyond.

CAL/PH-C29-07: 26 Jul 2022

### Calibration Results:

#### Pre Calibration

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (°C)
A1				401.5	21.5	1.5
A2				401.2	21.2	1.5
A3				399.1	19.1	1.5
A4				397.8	17.8	1.5
A5				395.1	15.1	1.5
B1				396.6	16.6	1.5
B2				395.1	15.1	1.5
B3				392.9	12.9	1.5
B4				391.6	11.6	1.5
B5				390.7	10.7	1.5
C1	380	380	380	395.3	15.3	1.5
C2				396.6	16.6	1.5
C3				392.8	12.8	1.5
C4				391.7	11.7	1.5
C5				390.3	10.3	1.5
D1				397.6	17.6	1.5
D2				396.6	16.6	1.5
D3				395.0	15.0	1.5
D4				394.2	14.2	1.5
D5				393.6	13.6	1.5

Certificate No.: C29240011

Page: 3 of 4



Certificate No.: C29240011

Page: 4 of 4

### Calibration Results:

#### Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (°C)
A1				382.5	17.5	1.5
A2				382.4	17.4	1.5
A3				382.1	17.1	1.5
A4				379.7	14.7	1.5
A5				378.3	13.3	1.5
B1				380.1	15.1	1.5
B2				380.1	15.1	1.5
B3				378.6	13.6	1.5
B4				378.3	13.3	1.5
B5				379.1	14.1	1.5
C1	380	385	385	380.1	15.1	1.5
C2				380.1	15.1	1.5
C3				378.9	13.9	1.5
C4				378.2	13.2	1.5
C5				377.3	12.3	1.5
D1				380.5	15.5	1.5
D2				380.6	15.6	1.5
D3				378.1	13.1	1.5
D4				378.7	13.7	1.5
D5				377.7	12.7	1.5

The End of Certificate

Unit: Room and Unit info  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
2023 measurement uncertainty measurement/traceability measurement 10200  
Phone: +66 203 7100 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

Delivering Growth - in Asia and Beyond.

CAL/PH-C29-07: 26 Jul 2022



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

ขอเสนอ: Block Digestion Unit

รุ่น: KT-20s

เลขที่ใบงาน: WO-00020429

ตรวจสอบ (วัน)	รายการตรวจสอบ	ตรวจสอบ (วัน)	ผลการตรวจสอบ
11 Mar 2024		11 Mar 2024	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
General			
<input type="checkbox"/>	<input type="checkbox"/> 1. สายไฟ	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 2. การตั้งค่า Main Switch	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 3. การตั้งค่า Selector key	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 4. การตั้งค่า Display	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 5. สายไฟ Hole	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 6. สายไฟปลั๊ก	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 7. สายไฟเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 8. สายไฟเครื่องในสายไฟเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>

ตรวจสอบ:

Mr. Thanathorn Phunook  
Service Engineer



## Certificate of Calibration

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: SevenCompact 8220  
Serial No.: C104059460  
ID No.: RYO\_EN0163  
Condition As-Received: Used Item  
Received Date: 18 January 2024  
Calibration Date: 19 January 2024  
Reference: 2401-057908C-2  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand

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

Calibrated by: Wankom Lemphakul  
Approved by: [Signature]  
( ) Sathip Meangmai  
( ) Wankom Lemphakul  
( ) Porpan Pajim

Issue Date: 24 January 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 2: Equipment Calibration and Testing Services.

Cert. No.: 2401406

Page: 1 of 3





Cert.No.: 24CH96  
Page: 2 of 3

#### Condition of this calibration result

##### 1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23C202	27 Aug 2024
2) Ref. Standard Thermometer	4862054	119RC044	23895	29 July 2024

This certificate is traceable to the International System of Unit maintained through:  
- Technology Promotion Association (Thailand-Japan)  
- The measurement results are traceable to SI through CPA mem Ltd.,  
ANIS-ASO National Accreditation Board, Accredited No. ANI-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.886	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

##### Calibration Results

###### Function : mV Measurement

Performing standard curve by Fluke at pH (4.7, 10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement (mV)	Coverage factor
pH Meter	4.008	177.48	177.4	0.058	2.00
S/N: C104050460	7.000	0.00	0.0	0.058	2.00
	10.000	-177.48	-177.5	0.058	2.00

Sathip

a 1198287



Cert.No.: 24CH96  
Page: 3 of 3

#### Calibration Results

##### Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.01, 7.00, 9.01)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (pH)	Coverage factor
pH Electrode	4.008	4.013	176.0	0.0054	2.07
S/N: 3335347	7.000	7.001	0.0	0.0064	0.99
	9.997	9.995	-174.1	0.0065	2.00

##### Function : Temperature Measurement

###### (\*) Without adjustment

This equipment was connected with Temperature Probe:

- Model: InLab/Expert Pro-ISM

- Serial No.: 3220367

- Dimension of probe

- Length: 120 mm.

- Diameter: 12 mm.

- Immersion Depth: 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (°C)	Coverage factor
25.0	25.001	15.2	0.199	0.13	2.00

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

-0-



TECNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
304 PATTANAKARN ROAD NO. 14, BANGKOK, THAILAND, 10260  
TEL: 0-2713-3000-2 FAX: 0-2719-9446



#### Certificate of Calibration

Certificate No.: 24C279  
Page: 1 of 2

Equipment: pH Meter  
Manufacturer: Metro Toledo  
Model: SevenCompact 5220  
Serial No.: C140509400  
ID No.: RYG-EN0103  
Condition As-Received: Used Item  
Received Date: 16 January 2024  
Calibration Date: 23 January 2024  
Reference: 2441-0579050C  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rajyong Branch)  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 5 ) %  
610/10 Moo 5, T. Maenam Riva, A. Phukdang, Rayong 21140, Thailand

Procedure used: Calibration was conducted using calibration procedure No. CP-E17 According to EURAMET cg-15.

#### Condition of this result of calibration

##### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Point Calibrator	500GA	631011	EJ23200035	29 May 2024

2. This result of calibration was made on request at the point specified by customer.  
3. This certificate is valid only to the item calibrated on date and place of calibration.  
4. This Calibration is traceable to the International System of Unit measurement through:  
- ANI Calibration Co., Ltd., ANAB Accredited No. Calibration AC-2008

Calibrated by: Wuthasarn Wongthaisri  
Issue Date: 24 January 2024  
Approved Signature: [Signature]  
[Signature]  
[Signature]

n 0333296



Cert. No.: 24CH96  
Page: 2 of 2

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

##### Function: DC voltage measurement

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (mV)
-200.0000	-200.0	0.0	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	50.0	0.0	61
100.0000	99.9	-0.1	63
150.0000	149.9	-0.1	65
200.0000	199.9	-0.1	68

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

UUC\* = Unit Under Calibration.

-0-

a 1198963

#### Agilent Technologies

##### Customer Contact

ALS Laboratory Group (Thailand) Co., Ltd.  
Head Office  
104 Phatthanakan Rd. Phatthanakan Rd.  
Bangkok 10110 Thailand  
Tel: 02-01000000  
Email: sales@agilent.com

Invoice To:  
ALS Laboratory Group (Thailand) Co., Ltd.  
Head Office  
104 Phatthanakan Rd. Phatthanakan Rd.  
Bangkok 10110 Thailand  
Tel: 02-01000000

Delivery Site:  
ALS Laboratory Group (Thailand) Co., Ltd.  
Head Office  
104 Phatthanakan Rd. Phatthanakan Rd.  
Bangkok 10110 Thailand  
Tel: 02-01000000

##### Product: Agilent 7700 Series

Agilent Technologies (Thailand) Limited, Head Office  
104 Phatthanakan Rd. Phatthanakan Rd.  
Bangkok 10110 Thailand  
Tel: 02-01000000

##### SERVICE REPORT

Customer Purchase Order Number: 7071010  
Customer Name: 7071010  
Service Request: Service Request Ref: 7071010  
Service Completion: 68810001

REVIEW BY: [Signature]  
APPROVED BY: [Signature]  
NEXT CAL. DATE: 12/16/2025

Direct Inquiry to:  
Contact Name: [Signature]  
Contact E-mail: [Signature]  
Contact Fax: [Signature]

##### Notes

1. This report is for informational purposes only. It does not constitute a warranty or a contract. The actual performance of the equipment may vary from the information provided in this report. The information provided in this report is for informational purposes only. It does not constitute a warranty or a contract. The actual performance of the equipment may vary from the information provided in this report.

Page 1 of 1

##### Service Instrument

Model Number	Model Description	Serial Number	System Handle	Parent Asset
915-0A-7700-E	ICP-MS 7700 System Enhanced		ICP-MS 7700 (HPLC)	
61316A	1200 ThermoStar Column	DEACN1200	ICP-MS 7700 (HPLC)	SYS-04-7700-E
61326B	1200 Standard Autosampler	DEACN1200	ICP-MS 7700 (HPLC)	SYS-04-7700-E
61311B	1200 ThermoStar Pump	DEACN1200	ICP-MS 7700 (HPLC)	SYS-04-7700-E
61311A	Agilent 7700 ICP-MS	JP12001612	ICP-MS 7700 (HPLC)	SYS-04-7700-E

##### Service Item

Item	Service/Part #	Description	Qty	Entitlement	Service Start/End
1000	1000	Enclosure Operational Qualification	1.00	Entitlement: 100 % covered	12.12.2023 12.12.2023
1010	1010-6869	ICP-MS Checkout Solutions	1.00	Entitlement: 100 % covered	

##### Additional Information

Page 2 of 2

**Metrological Center**  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Bangka, A.Kaengkhro, Bangkok 10110  
Telephone : +66 2 586 8792-4 Fax : +66 2 586 5109  
Website : www.sci-eco.co.th E-Mail : cal@sci-eco.co.th

Certificate No. T231676

Page 1 of 6

#### Certificate of Calibration

Equipment : HEATING BLOCK  
Manufacturer : Environmental Express  
Model : SC 196  
Serial No. : 6974CECW3285  
Customer Code : BKK\_EL0054  
ID No. : T5306A3  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan Rd., Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250  
Customer Location : Acid Digestion Lab  
Date of Receipt : 13 September 2023  
Calibrated By : Saneer Musikawan (Site Calibration Manager)  
Approved By : [Signature] / Sujar Nakakred (Site Calibration Manager)  
Date of Issue : 21 SEP 2023

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

This Certificate is issued in accordance with the conditions of accreditation issued by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and is the basis of measurement realized at the corresponding national standard laboratory. This certificate does not be reproduced other than in full with the prior written approval of the Metrological Center.

Page 1 of 6

**Metrological Center**  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Bangka, A.Kaengkhro, Bangkok 10110  
Telephone : +66 2 586 8792-4 Fax : +66 2 586 5109  
Website : www.sci-eco.co.th E-Mail : cal@sci-eco.co.th

Certificate No. T231676

Page 2 of 6

#### Calibration Report

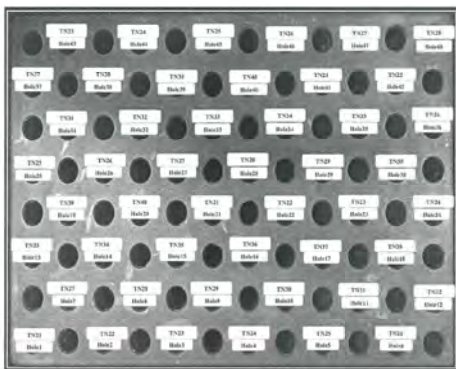
Equipment : HEATING BLOCK  
Date of Calibration : 22 September 2023  
Environment : Temperature : 23.8-25.3 °C  
Line Voltage : 221.8-226.3 V  
Relative Humidity : 55-65 % RH  
Condition of this result of calibration :  
1. This equipment was calibrated by using 20 standard thermocouples type T into its chamber, for better use standard thermocouples type T use for ambient temperature measurement. The calibration was done as according to NIST-720.  
All data show below were final values and the initial data from customer request. The temperature inside used was based on ITS-90.  
2. Reference Standard Instrument :  
Instrument : Model : Certificate No. : Due Date :  
TC : TYP T : T230014 : 17 January 2024  
TC : TYP T : T230014 : 17 January 2024  
DATA LOGGER : 34979A : T230014 : 17 January 2024  
3. This certificate is traceable to:  
National Institute of Standards and Technology (NIST) through Metrological Center / NIST-TSD-TS 1907 CALIBRATION (2014)  
4. Condition of calibrated item : good  
Equipment Description :  
Tare Container : 2 : Min : Max : At : 35 °C  
Front Air Flow : Open : Min : Max : Min : Max :  
X : Not Available  
Adjustment :  
1 : Initial adjustment  
X : After adjustment  
Approved By : [Signature]

Page 3 of 3

Page 2 of 6



### Calibration Report



FRONT CONTROL

Approved By: \_\_\_\_\_

FM-L13 30630-05-07

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26
R1 Hole1-Hole6	Max	93.01	94.41	93.28	93.41	94.51	95.17
	Min	92.57	93.87	94.25	94.02	94.80	94.70
	Average	92.79	94.14	93.76	93.72	94.66	94.94
R2 Hole7-Hole12	Max	93.34	95.43	94.19	93.14	93.25	94.07
	Min	92.94	94.35	93.72	92.71	94.90	94.91
	Average	93.15	95.19	94.96	92.93	94.15	94.77
R3 Hole13-Hole18	Max	93.37	93.39	93.25	93.21	92.33	93.21
	Min	92.99	92.99	94.79	94.42	94.88	94.96
	Average	93.18	93.39	94.06	93.82	93.11	94.13
R4 Hole19-Hole24	Max	93.39	94.42	94.32	94.24	94.43	94.67
	Min	92.21	94.20	94.12	92.58	94.29	94.27
	Average	92.80	94.31	94.33	93.46	94.43	94.47
R5 Hole25-Hole30	Max	93.39	94.42	94.32	94.24	94.43	94.67
	Min	92.21	94.20	94.12	92.58	94.29	94.27
	Average	92.80	94.31	94.33	93.46	94.43	94.47
R6 Hole31-Hole36	Max	93.39	94.42	94.32	94.24	94.43	94.67
	Min	92.21	94.20	94.12	92.58	94.29	94.27
	Average	92.80	94.31	94.33	93.46	94.43	94.47
R7 Hole37-Hole42	Max	93.39	94.42	94.32	94.24	94.43	94.67
	Min	92.21	94.20	94.12	92.58	94.29	94.27
	Average	92.80	94.31	94.33	93.46	94.43	94.47
R8 Hole43-Hole48	Max	93.39	94.42	94.32	94.24	94.43	94.67
	Min	92.21	94.20	94.12	92.58	94.29	94.27
	Average	92.80	94.31	94.33	93.46	94.43	94.47

Approved By: \_\_\_\_\_

FM-L13 30630-05-07

### Calibration Report

Measurement Results:

HEATING BLOCK		Temperature Distribution	
Setting (°C)	Reading (°C)	Stability (±°C)	Uniformity (±°C)
100.0	100.1, 100.5	0.20	0.11
102.0	102.5, 102.1	0.10	0.10

\* The quoted uncertainty exclude "air conditioning"

The calibration result apply only with the above calibration 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 is a distribution, providing a level of confidence of approximately 95 %.

Approved By: \_\_\_\_\_

FM-L13 30630-05-07

### Certificate of Calibration

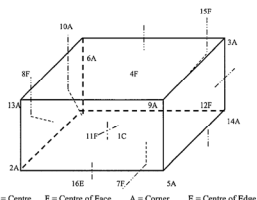
Equipment	Chamber (Cooling Room)
Manufacturer	KOLDTCH
Model	KM 320
Serial No.	TRN-1012061/05
Customer Code	BKK_EN0167
ID No.	T2463A3
Customer	ALS Laboratory Group (Thailand) Co., Ltd. 104 Phatthanakan 40 Phatthanakan Rd., Khlong Phatthanakan, Khet Suan Luang, Bangkok 10250
Customer Location	Laboratory
Date of Receipt	29 November 2023
Calibrated By	Atiphong Rongrat (Technician)
Approved By	Boonrat Sanyawong (Site Calibration Manager)
Date of Issue	05 JAN 2024

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L13 11818-08-06

### 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: \_\_\_\_\_

FM-L13 11818-08-06

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26
R1 Hole1-Hole6	Max	103.23	104.32	103.45	103.52	104.49	105.27
	Min	104.94	103.85	102.27	103.44	104.11	104.95
	Average	104.08	104.13	102.86	103.41	104.30	105.12
R2 Hole7-Hole12	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R3 Hole13-Hole18	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R4 Hole19-Hole24	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R5 Hole25-Hole30	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R6 Hole31-Hole36	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R7 Hole37-Hole42	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21
R8 Hole43-Hole48	Max	103.37	103.69	103.62	104.30	104.49	105.27
	Min	102.30	103.12	103.14	103.22	103.12	103.14
	Average	102.83	103.41	103.38	103.76	103.80	104.21

Approved By: \_\_\_\_\_

FM-L13 30630-05-07

### Calibration Report

Equipment	Chamber (Cooling Room)
Date of Calibration	6 December 2023
Environment	Temperature : 23.44 °C Line Voltage : 221.4-238.2 V Relative Humidity : 55 - 65 %RH
Condition of this results of calibration :	
1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T for ambient temperature measurement. The calibration was done in accordance with ISO 17025 (based on ASTM E1455-04 (Reapproved 2001) and AS2853-1996).	
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS-90 (1.5 - 100 °C).	
2. Reference Standard Instrument :	
Instrument	Model
TC	TYFE T
TC	TYFE T
DATA LOGGER	4490A
Instrument No.	TN161-TN170
Certificate No.	T230773
Due Date	10 April 2024
Instrument No.	TN171-TN180
Certificate No.	T230773
Due Date	10 April 2024
3. This certificate is transferable to :	
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244)	
4. Evaluation of calibration item : good	
Equipment Description :	
Time Control	Hour 30 Minute At 3 °C
Fresh Air Display	Open Min Medium Max
Adjustment	( X ) without adjustment ( ) after adjustment

Approved By: \_\_\_\_\_

FM-L13 11818-08-06

### Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)							
3.0	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169
	2.83	3.34	2.95	3.46	3.45	3.76	3.25	3.46	3.39
	3.33	3.39	3.15	3.45					

Chamber (Cooling Room )			Temperature Distribution				Coverage Factor k	
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)		
	Min	Max						
3.0	2.8	4.1	3.5	3.36	1.10	2.00	1.90	2.09

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

Approved By: \_\_\_\_\_

FM-L13 11818-08-06



ภาคผนวก จ

---

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน







- en -

Final

- 2 -

3ma

- ୫ -

8

สิ่งที่ส่งมาด้วย ๓



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

40 Manganese...

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

น้ำใต้ดิน...

## น้ำใต้ดิน จำนวน 126 รายการ

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

18 Bis(2-ethylhexyl)phthalate...

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

36 Chrysene...



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

56 1,3-Dichloropropene...

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

76 γ-HCH...

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

94 N-Nitrosodiphenylamine...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup> 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>8</sub> -C <sub>10</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2,3)</sup>

110 TPH (C<sub>8</sub>-C<sub>10</sub>)...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C <sub>8</sub> -C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</sup>
111	TPH (C <sub>16</sub> -C <sub>32</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(4)</sup>
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
126	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(4)</sup>

จากผลเสีย...

จากผลเสีย (ปัสสาวะ) จำนวน 28 รายการ

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

15 Lead...

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

27 Vanadium...

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

สิ่งปฏิกูลหรือวัสดุที่ไม่ได้เป็นน้ำ จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

5 Beryllium...



ลำดับที่	สารเคมี	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.16.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.17.19)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.16.19)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.17.19)</sup>

10 Chromium (VI)...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Digestion, Colorimetric Method <sup>(1.6.19)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8.19)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup>

2) Soxhlet...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>

22 Mercury...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1.6.20)</sup> 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1.6.30)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(30)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(21)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.24)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.24)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(11.24)</sup>

- 2-Chlorobiphenyl...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup> Electrometric Method <sup>(23,24)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 5) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 6) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 7) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
29	pH	
30	Selenium	

31 Silver...

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

ดิน...

## ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13)</sup>
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup>

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,23)</sup>
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13,23)</sup>
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,26)</sup>

23 Cadmium...



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

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(7,18,20)</sup>
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13)</sup>

73 n-Hexane...



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

84 Methanol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

96 Polychlorinated biphenyls (PCBs)

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

99 Phenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
108	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(11,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
110	TPH (C <sub>16</sub> -C <sub>35</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(11,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

115 2,4,5-Trichlorophenol...



ลำดับที่	สารเคมี	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
125	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>

**เอกสารอ้างอิง**

- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2566. เรื่อง การจัดการสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา, 31 พฤษภาคม 2566. เล่มที่ 140 ตอนพิเศษ 126 ง.
- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเคมีภัณฑ์ที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้กลั่นเป็นเชื้อเพลิง. ราชกิจจานุเบกษา, 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125 ง.
- สมาคมวิศวกรสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.
- APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24<sup>th</sup> ed. Washington, DC: APHA, 2023.

5. United States...

20. United States...

- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2023.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. SW-846, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Acid Digestion of Sludges and Sediments and Soils. SW-846 Method 3050B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Alkaline Digestion for Hexavalent Chromium. SW-846 Method 3060A, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Separatory Funnel Liquid-Liquid Extraction. SW-846 Method 3510C, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Soxhlet Extraction. SW-846 Method 3540C, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Automated Soxhlet Extraction. SW-846 Method 3541, 1994.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Microscale Solvent Extraction (MSE). SW-846 Method 3570, 2002.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Volatile Organic Compounds (VOCs) in Various Sample Matrices Using Equilibrium Headspace Analysis. SW-846 Method 5021A, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Purge-and-Trap for Aqueous Samples. SW-846 Method 5030B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Atomic Emission Spectrometry. SW-846 Method 6010B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Mass Spectrometry. SW-846 Method 6020A, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Antimony and Arsenic (Atomic Absorption, Borohydride Reduction). SW-846 Method 7062, 1994. (เพิ่ม)
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Chromium, Hexavalent (Colorimetric). SW-846 Method 7196A, 1992. (เพิ่ม)

20. United States...

- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). SW-846 Method 7471B, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry. SW-846 Method 7473, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Nonhalogenated Organics by Gas Chromatography. SW-846 Method 8015C, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. pH Electrometric Measurement. SW-846 Method 9040C, 2004.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Soil and Waste pH. SW-846 Method 9045D, 2004.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260D, 2018.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8270E, 2018.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Total and Amenable Cyanide: Distillation SW-846 Method 9010B, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Cyanide Extraction Procedure for Solids and Oil. SW-846 Method 9013A, 1996.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Cyanide in Waters and Extracts Using Titrimetric and Manual Spectrophotometric Procedures. SW-846 Method 9014, 2014.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Mercury in Sediment and Tissue Samples by Atomic Fluorescence Spectrometry. SW-846 Method 7474, 2007.
- United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Ultrasonic Extraction. SW-846 Method 3550C, 2007. (เพิ่ม)

ที่ ๒๒๒๒๒๒๒๒/๔๑๒๑



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ เมษายน ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์  
เรียน กรรมการผู้จัดการ บริษัท เอสแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด  
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอรับสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๙ มีนาคม ๒๕๖๖

ตามคำขอที่ยังถึง บริษัท เอสแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๙๐๐๔๔-๙๐๔ ของพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๓. ให้อยู่แก่เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

- |   |                           |
|---|---------------------------|
| ๑) นางสาวพรณิศา พุ่มคง  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๐๒๕ |
| ๒) นายกัญญ์ สุทธะ   | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๒๒๑ |
| ๓) นางสาวศุภรดา ปิ่นมูรา  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๘ |
| ๔. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย |                           |
| ๑) นางสาวฐานิดา กิ่งนันท  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๒ |
| ๒) นางสาวกัญญ์นิลดา สายคำ                                       | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๓ |
| ๓) นางสาวณัฐนันท์ กิ่งนันท                                      | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๔ |
| ๔) นายธีรวัฒน์ วงศ์นาค  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๕ |
| ๕) นายฤทธิพล ปัญญาวัฒน์   | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๖ |
| ๖) นายอชกร ธรรมา  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๗ |
| ๗) นายธีรวัฒน์ ผ่องใสสวน  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๘ |
| ๘) นายณัฐพงศ์ โสภ   | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๘๙ |
| ๙) นายธีรวัฒน์ ปานเพ็ญ  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๙๐ |
| ๑๐) นายณัฐพล ชุ่มชื่น   | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๙๑ |
| ๑๑) นายธนนา สุภาพันธุ์  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๙๒ |
| ๑๒) นายธนนา สุภาพันธุ์  | ทะเบียนเลขที่ ๖-๒๐๔-๙๐๑๙๓ |

หนึ่ง หนังสือฉบับนี้



๕๒) นายพชรกร...



๕๒) นายพรกร เจ็งเจริญ	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๔
๕๓) นายพิวกร เชื้อมุก	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๕
๕๔) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๖
๕๕) นายอภิชาติ วิลาศ	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๗
๕๖) นายจิรวิทย์ ศรีรักษา	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๘
๕๗) นายประสาธน์ เสถียรเพชร	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๕๙
๕๘) นายภาณุวัฒน์ วิริยะ	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๖๐
๖๐) นายสันติ ชัยชนะ	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๖๑
๖๑) นายพินิจ กุลชาติ	ทะเบียนเลขที่ 7-๒๒๓-จ-๐๐๖๒

ค. ขอบข่ายนิยามสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย นำได้ต้น อากาศเสียตามสิ่งที่มีมาด้วย

หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๒๘ มิถุนายน ๒๕๖๓ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนหรือปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุหรือเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนหรือปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพอส กอนกรอง)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและพัฒนานโยบายสิ่งแวดล้อมภาคตะวันออก  
โทร. ๐ ๓๓๓๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒  
อีเมล: eww@dw.mae.go.th



"อุตสาหกรรมก้าวไกล ประเทไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เอแอลแอล แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน 7-๒๒๓  
ที่ ๐๓๒๐/ ๗ ๕๓ ๘ ลงวันที่ ๐๔ สิงหาคม ๒๕๖๓

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๕ รายการ  
น้ำเสีย จำนวน 14 รายการ

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

น้ำได้ดิน จำนวน 3 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method <sup>[2]</sup>
2	pH	Electrometric Method <sup>[2]</sup>
3	Phenols	Distillation, Direct Photometric Method <sup>[2]</sup>

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

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

เอกสารอ้างอิง

- ธงชัย พรณสวัสดิ์ และวิบูลย์ลักษณ์ วิสุมธิดีกิตติ์, บรรณาธิการ. (2547) คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย.
- APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24<sup>th</sup> ed. Washington, DC : APHA, 2023
- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้ถ่านเป็นเชื้อเพลิง. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 1254
- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำของโรงงาน. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 1254
- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2017.
- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2019.

- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2020.
- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2023.
- United States Environmental Protection Agency. Determination of Carbon Monoxide Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 10, 2017.
- United States Environmental Protection Agency. Determination of Oxide of Nitrogen Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 7E, 2023.
- United States Environmental Protection Agency. Determination of Sulfur dioxide Emission from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 6C, 2017.





๐๕ ตุลาคม ๒๕๖๗

เรื่อง แก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง หนังสือ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขที่ Env 2024/005

ลงวันที่ ๓๐ สิงหาคม ๒๕๖๗

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้คู้ อำเภอปลวกแดง จังหวัดระยอง ขอแก้ไขชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน เนื่องจากความคลาดเคลื่อน ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรม ได้รับทราบและดำเนินการแก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕ ราย ตามที่แจ้งเรียบร้อยแล้ว เป็นดังนี้

ลำดับที่ ๒๗ นางพจนา สีดา

ลำดับที่ ๒๘ นางสาวอนิศา กุศลวิวงศ์

ลำดับที่ ๓๐ นางชลธิชา สิบงคง

ลำดับที่ ๓๖ นายสุทธิดำรงค์ โชคประดิษฐ์

ลำดับที่ ๔๒ นายกัมพล มณีสัมพันธ์

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

น

(นายพรยศ กสิณกรอง)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและพัฒนาระบบผลิตโรงงานภาคตะวันออก

โทร. ๐ ๓๓๓๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ ewrwd@dw.mil.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”







บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

104 ซอยพัฒนาการ 40 ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพฯ 10250

โทรศัพท์ 0-2760-3000 โทรสาร 0-2760-3197

[www.alsglobal.com](http://www.alsglobal.com)