

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal.	Freq. Calibrate (Months)
Stack (CEM)	Oxides of Nitrogen	Analyzer, System calibration, Sta	-	-	-	-
Stack (CEM)	Oxides of Nitrogen	Analyzer, System calibration, Sta	-	-	-	-
Stack	Total Suspended Particulate	Console Control Unit	BKK_F50518	13-Jan-23	13-Jul-23	6
Stack	Total Suspended Particulate	Flue gas Analyzer	RYG_F50563	28-Dec-22	28-Dec-23	12
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	1-Mar-23	1-Mar-24	12
Stack	Ammonia	Console Control Unit	BKK_F50518	13-Jan-23	13-Jul-23	6
Stack	Ammonia	Flue gas Analyzer	RYG_F50563	28-Dec-22	28-Dec-23	12
Stack	Ammonia	Dry Gas	BKK_F50525	13-Jan-23	13-Jul-23	6
Stack	Ammonia	SPECTROPHOTOMETER	RYG_EN0037	27-Sep-22	27-Mar-24	18
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_F50255	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_F50264	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_F50797	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_F50457	5-Jan-23	5-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50254	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50263	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	BKK_F50796	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50456	4-Jan-23	4-Jul-23	6
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50399	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50190	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50184	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50186	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	1-Mar-23	1-Mar-24	12
Ambient	Total Suspended Particulate	High Volume	RYG_F50396	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50181	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50395	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50291	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	1-Mar-23	1-Mar-24	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_F50531	19-Jan-23	19-Jul-24	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_F50496	17-Jan-23	17-Jan-24	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50437	7-Sep-22	7-Sep-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50438	7-Sep-22	7-Sep-23	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_F50210	1-Dec-22	1-Dec-23	12
Heat	Heat Stress	Heat Stress Monitor	RYG_F50231	3-Aug-22	3-Aug-23	12
Heat	Heat Stress	Heat Stress Monitor	RYG_F50236	21-Nov-22	21-Nov-23	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	27-Feb-23	27-Feb-24	12
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	14-Feb-22	15-Aug-23	18
Rayong Lab	BOD	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	1-Mar-23	1-Mar-24	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	1-Mar-23	1-Mar-24	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0006	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	20-Oct-22	20-Apr-24	18
Rayong Lab	Temperature	Thermometer	RYG_F50391	1-Feb-23	1-Feb-24	12
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	25-Jan-23	25-Jul-24	12
Rayong Lab	Residual Free Chlorine	Chamber (Cold Room)	RYG_EN0184	25-Jan-23	25-Jul-24	18
Water Lab	Chloroform	Gas Chromatography (MSD)	BKK_EN0059	21-Jun-22	21-Dec-23	18
Water Lab	Bromoform	Gas Chromatography (MSD)	BKK_EN0059	21-Jun-22	21-Dec-23	18
Water Lab	Dibromochloromethane	Gas Chromatography (MSD)	BKK_EN0059	21-Jun-22	21-Dec-23	18
Water Lab	Total Trihalomethanes	Gas Chromatography (MSD)	BKK_EN0059	21-Jun-22	21-Dec-23	18
Water Lab	Bromodichloromethane	Gas Chromatography (MSD)	BKK_EN0059	21-Jun-22	21-Dec-23	18

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Lot No. 2321660-1

ANALYZER CALIBRATION DATA

Client : Global Power Synergy PCL Location : HRSGe 1
Date : 03 Mar 23 Test Operator : Sakait P.

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

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.05	0.01	0.16
Low-Level Gas	7.93	7.98	7.94	0.16
Span Gas	16.00	16.05	16.01	0.16

NO₂ ANALYZER
Model : TELEDYNE API 200EH Serial No. : 774
Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.09	0.01	0.08
Low-Level Gas	50.41	50.50	50.42	0.08
Span Gas	80.27	80.36	80.28	0.08

SO₂ ANALYZER
Model : TELEDYNE API 100EH Serial No. : 437
Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.03	0.01	0.02
Low-Level Gas	51.61	51.64	51.62	0.02
Span Gas	79.00	79.03	79.01	0.02

Calibrated by

Sakait P.

(Mr. Sakait Phalsanphlout)
Environmental Field Scientist (4)

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

ALS Laboratory Group



Lot No. 2321660-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Global Power Synergy PCL Location : HRSGe 1
Date : 03 Mar 23 Test Operator : Sakait P.

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

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.05	0.05	0.00	0.01	0.16	0.16
Upscale Gas	16.05	16.05	0.00	16.01	0.16	0.16

NO₂ ANALYZER
Cylinder Conc. (ppm) : 80.27 Span (ppm) : 100

	NO ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.09	0.09	0.00	0.01	0.08	0.08
Upscale Gas	80.36	80.36	0.00	80.28	0.08	0.08

SO₂ ANALYZER
Cylinder Conc. (ppm) : 79.00 Span (ppm) : 100

	SO ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.03	0.03	0.00	0.01	0.02	0.02
Upscale Gas	79.03	79.03	0.00	79.01	0.02	0.02

Calibrated by

Sakait P.

(Mr. Sakait Phalsanphlout)

Environmental Field Scientist (4)

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

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EMISSION TEST RESULT

Client : Global Power Synergy PCL Run # : 1
Date : 03 Mar 23 Location : HRSGe 1
Start Time : 13:15 Test Operator : Sakait P.
SO₂ Analyzer Model : TELEDYNE API 100EH Serial No. : 437
NO₂/O₂ Analyzer Model : TELEDYNE API 200EH Serial No. : 774
CO/CO₂ Analyzer Model : TELEDYNE API 300EM Serial No. : 451

Time (min)	O ₂ (%)	CO ₂ (%)	NOx (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
13:15	13.76	4.03	9.99	0.02	-	-
13:16	13.73	4.04	10.00	0.02	-	-
13:17	13.74	4.06	10.08	0.04	-	-
13:18	13.75	4.05	10.06	0.03	-	-
13:19	13.75	4.04	9.93	0.02	-	-
13:20	13.77	4.02	9.82	0.03	-	-
13:21	13.76	4.04	9.96	0.03	-	-
13:22	13.76	4.04	9.61	0.02	-	-
13:23	13.73	4.04	9.69	0.02	-	-
13:24	13.74	4.04	9.69	0.03	-	-
13:25	13.75	4.02	9.66	0.03	-	-
13:26	13.75	4.03	9.69	0.03	-	-
13:27	13.75	4.04	9.72	0.04	-	-
13:28	13.76	4.04	9.68	0.02	-	-
13:29	13.75	4.04	9.62	0.03	-	-
13:30	13.75	4.04	9.59	0.03	-	-
13:31	13.75	4.04	9.61	0.03	-	-
13:32	13.75	4.03	9.61	0.03	-	-
13:33	13.74	4.04	9.60	0.03	-	-
13:34	13.73	4.04	9.66	0.03	-	-
13:35	13.73	4.05	9.73	0.03	-	-
Average	13.76	4.04	9.75	0.03	-	-

Sakait P.

(Mr. Sakait Phalsanphlout)

Environmental Field Scientist (4)

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

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EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	2
Date		03 Mar 23	Location	HRSGs 1
Start Time		13:38	Test Operator	Saksat P.
SO ₂ Analyzer Model		TELEDYNE API 100EH	Finish Time	13:58
NO _x /O ₂ Analyzer Model		TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model		TELEDYNE API 300EH	Serial No.	774
			Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
13:36	13.75	4.04	9.70	0.04	-	
13:37	13.76	4.02	9.50	0.03	-	
13:38	13.74	4.03	9.41	0.03	-	
13:39	13.72	4.04	9.43	0.02	-	
13:40	13.72	4.05	9.53	0.03	-	
13:41	13.72	4.06	9.62	0.02	-	
13:42	13.72	4.05	9.75	0.04	-	
13:43	13.73	4.05	9.75	0.03	-	
13:44	13.74	4.05	9.55	0.02	-	
13:45	13.74	4.05	9.33	0.02	-	
13:46	13.72	4.05	9.31	0.02	-	
13:47	13.72	4.05	9.48	0.02	-	
13:48	13.72	4.04	9.69	0.03	-	
13:49	13.73	4.04	9.78	0.02	-	
13:50	13.76	4.04	9.78	0.02	-	
13:51	13.77	4.03	9.77	0.02	-	
13:52	13.76	4.04	9.73	0.03	-	
13:53	13.75	4.04	9.77	0.03	-	
13:54	13.76	4.03	9.72	0.03	-	
13:55	13.76	4.03	9.63	0.01	-	
13:56	13.76	4.04	9.56	0.03	-	
Average	13.74	4.04	9.61	0.03	-	

Saksat P.

(Mr. Saksat Phaisanphit)

Environmental Field Scientist (4)

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EMISSION TEST RESULT

Client		Global Power Synergy PCL.	Run #	3
Date		03 Mar 23	Location	HRSGs 1
Start Time		13:57	Test Operator	Saksat P.
SO ₂ Analyzer Model		TELEDYNE API 100EH	Finish Time	14:17
NO _x /O ₂ Analyzer Model		TELEDYNE API 200EH	Serial No.	437
CO/CO ₂ Analyzer Model		TELEDYNE API 300EH	Serial No.	774
			Serial No.	451

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
13:57	13.76	4.05	9.52	0.03	-	
13:58	13.74	4.04	9.53	0.04	-	
13:59	13.73	4.04	9.67	0.03	-	
14:00	13.74	4.04	9.75	0.02	-	
14:01	13.74	4.04	9.75	0.02	-	
14:02	13.75	4.04	9.67	0.03	-	
14:03	13.74	4.04	9.69	0.04	-	
14:04	13.73	4.04	9.69	0.03	-	
14:05	13.75	4.02	9.68	0.03	-	
14:06	13.76	4.02	9.68	0.02	-	
14:07	13.74	4.03	9.75	0.03	-	
14:08	13.75	4.04	9.85	0.03	-	
14:09	13.75	4.04	9.86	0.04	-	
14:10	13.75	4.04	9.74	0.04	-	
14:11	13.73	4.04	9.65	0.03	-	
14:12	13.73	4.04	9.55	0.04	-	
14:13	13.72	4.04	9.54	0.03	-	
14:14	13.72	4.06	9.41	0.03	-	
14:15	13.72	4.01	9.36	0.04	-	
14:16	13.70	4.04	9.43	0.03	-	
14:17	13.70	4.06	9.57	0.02	-	
Average	13.74	4.04	9.64	0.03	-	

Saksat P.

(Mr. Saksat Phaisanphit)

Environmental Field Scientist (4)

FORM NO.: F-06-062 REVISION NO.: 2 ISSUE DATE: 306/19

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CEMs Opacity Data

Client Name		Global Power Synergy PCL.	Date	3-Mar-23
Plant Name		CUP4	Location	HRSGs 1

Run No.1		Run No.2		Run No.3		Run No.4		Run No.5	
Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)
13:15	5.84	14:00	5.81	14:50	5.79	10:20	4.95	11:08	4.97
13:16	5.81	14:01	5.82	14:51	5.73	10:21	4.94	11:09	4.98
13:17	5.81	14:02	5.83	14:52	5.76	10:22	4.93	11:10	4.99
13:18	-	14:03	5.82	14:53	5.79	10:23	4.95	11:11	4.99
13:19	-	14:04	5.81	14:54	5.80	10:24	4.93	11:12	5.02
13:20	-	14:05	5.82	14:55	5.74	10:25	4.91	11:13	5.09
13:21	-	14:06	6.29	14:56	5.73	10:26	4.91	11:14	5.12
13:22	-	14:07	6.03	14:57	5.73	10:27	4.87	11:15	5.18
13:23	-	14:08	5.80	14:58	5.80	10:28	4.86	11:16	5.21
13:24	-	14:09	5.80	14:59	5.75	10:29	4.87	11:17	5.28
13:25	-	14:10	5.78	15:00	5.75	10:30	4.94	11:18	5.28
13:26	-	14:11	5.82	15:01	5.77	10:31	4.94	11:19	5.29
13:27	-	14:12	5.80	15:02	5.72	10:32	4.92	11:20	5.24
13:28	-	14:13	5.79	15:03	5.77	10:33	4.88	11:21	5.21
13:29	-	14:14	5.79	15:04	5.78	10:34	4.91	11:22	5.18
13:30	-	14:15	5.76	15:05	5.72	10:35	4.91	11:23	5.14
13:31	-	14:16	5.76	15:06	5.78	10:36	4.91	11:24	5.10
13:32	-	14:17	5.79	15:07	5.77	10:37	4.91	11:25	5.09
13:33	-	14:18	5.77	15:08	5.76	10:38	4.92	11:26	5.11
13:34	-	14:19	5.80	15:09	5.76	10:39	4.85	11:27	5.08
13:35	-	14:20	5.73	15:10	5.77	10:40	4.91	11:28	5.10
13:36	-	14:21	5.76	15:11	5.78	10:41	4.83	11:29	5.11
13:37	-	14:22	5.78	15:12	5.76	10:42	4.87	11:30	5.10
13:38	6.63	14:23	5.73	15:13	5.77	10:43	4.84	11:31	5.12
13:39	6.62	14:24	5.77	15:14	5.79	10:44	4.89	11:32	5.11
13:40	6.33	14:25	5.75	15:15	5.77	10:45	4.91	11:33	5.08
13:41	6.07	14:26	5.73	15:16	5.78	10:46	4.87	11:34	5.07
13:42	5.91	14:27	5.73	15:17	5.75	10:47	4.92	11:35	5.12
13:43	5.86	14:28	5.74	15:18	5.76	10:48	4.91	11:36	5.10
13:44	5.86	14:29	5.74	15:19	5.76	10:49	4.88	11:37	5.11
13:45	5.87	14:30	5.74	15:20	5.69	10:50	4.91	11:38	5.17
13:46	5.81	14:31	5.74	15:21	5.74	10:51	4.88	11:39	5.14
13:47	5.83	14:32	5.74	15:22	5.71	10:52	4.92	11:40	5.15
13:48	5.76	14:33	5.76	15:23	5.74	10:53	4.92	11:41	5.15
13:49	5.77	14:34	5.69	15:24	5.67	10:54	4.93	11:42	5.17
13:50	5.79	14:35	5.73	15:25	5.65	10:55	4.93	11:43	5.19
13:51	5.80	14:36	5.68	15:26	5.64	10:56	4.97	11:44	5.19
13:52	5.81	14:37	5.66	15:27	5.69	10:57	4.97	11:45	5.19
13:53	5.82	14:38	5.72	15:28	5.68	10:58	4.93	11:46	5.23
13:54	5.83	14:39	5.70	15:29	5.70	10:59	4.93	11:47	5.27
13:55	5.83	14:40	5.72	15:30	5.69	11:00	4.93	11:48	5.32
13:56	5.85	14:41	5.71	15:31	5.69	11:01	4.92	11:49	5.29
13:57	5.88	14:42	5.73	15:32	5.68	11:02	4.95	11:50	5.27
Avg.	5.93	Avg.	5.78	Avg.	5.74	Avg.	4.91	Avg.	5.15



CEMs Opacity Data

Client Name		Global Power Synergy PCL.	Date	4-Mar-23
Plant Name		CUP4	Location	HRSGs 1

Run No.6		Run No.7		Run No.8		Run No.9		Run No.10	
Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)
11:55	5.41	12:45	4.96	13:35	4.96	14:25	4.91	15:15	4.91
11:56	5.39	12:46	4.95	13:36	5.01	14:26	4.92	15:16	4.91
11:57	5.42	12:47	4.96	13:37	5.01	14:27	4.94	15:17	4.94
11:58	5.40	12:48	4.95	13:38	5.02	14:28	4.92	15:18	4.92
11:59	5.42	12:49	4.98	13:39	4.97	14:29	4.91	15:19	4.92
12:00	5.44	12:50	5.05	13:40	4.98	14:30	4.89	15:20	4.91
12:01	5.42	12:51	5.04	13:41	4.97	14:31	4.89	15:21	4.95
12:02	5.37	12:52	5.06	13:42	4.98	14:32	4.87	15:22	4.92
12:03	5.35	12:53	5.06	13:43	4.97	14:33	4.94	15:23	4.91
12:04	5.36	12:54	5.06	13:44	4.96	14:34	4.90	15:24	4.89
12:05	5.39	12:55	5.06	13:45	5.01	14:35	4.90	15:25	4.92
12:06	5.36	12:56	5.10	13:46	5.04	14:36	4.94	15:26	4.92
12:07	5.35	12:57	5.09	13:47	4.98	14:37	4.95	15:27	4.92
12:08	5.38	12:58	5.07	13:48	5.00	14:38	4.94	15:28	4.92
12:09	5.39	12:59	5.10	13:49	5.04	14:39	4.91	15:29	4.93
12:10	5.37	13:00	5.07	13:50	5.00	14:40	4.91	15:30	4.94
12:11	5.42	13:01	5.09	13:51	4.95	14:41	4.90	15:31	4.91
12:12	5.38	13:02	5.08	13:52	5.00	14:42	4.87	15:32	4.95
12:13	5.44	13:03	5.11	13:53	5.00	14:43	4.91	15:33	4.96
12:14	5.44	13:04	5.07	13:54	4.95	14:44	4.91	15:34	4.98
12:15	5.45	13:05	5.07	13:55	4.94	14:45	4.90	15:35	4.97
12:16	5.41	13:06	5.03	13:56	4.94	14:46	4.90	15:36	4.98
12:17	5.43	13:07	5.04	13:57	4.94	14:47	4.90	15:37	5.04
12:18	5.48	13:08	5.04	13:58	4.97	14:48	4.86	15:38	5.04
12:19	5.48	13:09	5.03	13:59	4.96	14:49	4.86	15:39	5.00
12:20	5.51	13:10	5.04	14:00	4.93	14:50	4.88	15:40	5.06
12:21	5.51	13:11	5.05	14:01	4.95	14:51	4.90	15:41	5.05
12:22	5.49	13:12	5.06	14:02	4.91	14:52	4.88	15:42	5.04
12:23	5.49	13:13	5.05	14:03	4.89	14:53	4.85	15:43	5.06
12:24	5.44	13:14	5.07	14:04	4.92	14:54	4.90	15:44	5.04
12:25	5.39	13:15	5.06	14:05	4.89	14:55	4.94	15:45	5.05
12:26	5.37	13:16	5.07	14:06	4.90	14:56	4.91	15:46	5.06
12:27	5.35	13:17	5.05	14:07	4.91	14:57	4.90	15:47	5.03
12:28	5.33	13:18	5.07	14:08	4.93	14:58	4.88	15:48	5.04
12:29	5.29	13:19	5.06	14:09	4.94	14:59	4.92	15:49	5.03
12:30	5.25	13:20	5.03	14:10	4.95	15:00	4.91	15:50	5.01
12:31	5.21	13:21	5.02	14:11	4.95	15:01	4.90	15:51	5.05
12:32	5.18	13:22	5.03	14:12	4.98	15:02	4.89	15:52	5.07
12:33	5.09	13:23	5.04	14:13	4.96	15:03	4.89	15:53	5.05
12:34	5.07	13:24	5.04	14:14	4.95	15:04	4.90	15:54	5.01
12:35	5.03	13:25	5.05	14:15	4.98	15:05	4.86	15:55	5.05
12:36	4.97	13:26	5.01	14:16	4.98	15:06	4.83	15:56	5.03
12:37	4.96	13:27	5.04	14:17	4.94	15:07	4.88	15:57	5.04
Ave.	4.92	Ave.	5.05	Ave.	4.96	Ave.	4.90	Ave.	4.98



CEMs Opacity Data

Client Name Global Power Synergy PCL.
Plant Name CUP4Date 5-Mar-23
Location HRSGe 1

Run No.11		Run No.12		Run No.13		Run No.14		Run No.15	
Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)	Time	Opacity (%)
10:00	4.81	10:55	5.08	11:45	4.98	12:35	5.31	13:25	4.93
10:01	4.81	10:56	5.10	11:46	4.98	12:36	5.32	13:26	4.94
10:02	4.82	10:57	5.12	11:47	5.05	12:37	5.35	13:27	4.93
10:03	4.85	10:58	5.07	11:48	5.07	12:38	5.38	13:28	4.92
10:04	4.87	10:59	5.09	11:49	5.08	12:39	5.32	13:29	4.93
10:05	4.84	11:00	5.09	11:50	5.07	12:40	5.35	13:30	4.95
10:06	4.84	11:01	5.10	11:51	5.06	12:41	5.37	13:31	4.93
10:07	4.87	11:02	5.12	11:52	5.05	12:42	5.39	13:32	4.94
10:08	4.88	11:03	5.08	11:53	5.06	12:43	5.38	13:33	4.94
10:09	4.84	11:04	5.07	11:54	5.06	12:44	5.41	13:34	4.93
10:10	4.82	11:05	5.04	11:55	5.03	12:45	5.41	13:35	4.94
10:11	4.88	11:06	5.04	11:56	5.04	12:46	5.44	13:36	4.94
10:12	4.90	11:07	5.05	11:57	5.07	12:47	5.40	13:37	4.97
10:13	4.90	11:08	4.98	11:58	5.03	12:48	5.39	13:38	4.96
10:14	4.92	11:09	4.98	11:59	5.07	12:49	5.41	13:39	4.90
10:15	4.92	11:10	4.96	12:00	5.03	12:50	5.40	13:40	4.91
10:16	4.96	11:11	4.95	12:01	5.02	12:51	5.45	13:41	4.93
10:17	4.93	11:12	4.93	12:02	5.03	12:52	5.43	13:42	4.95
10:18	4.96	11:13	4.89	12:03	5.04	12:53	5.47	13:43	4.92
10:19	4.90	11:14	4.94	12:04	5.06	12:54	5.42	13:44	4.94
10:20	4.94	11:15	4.94	12:05	5.04	12:55	5.44	13:45	4.92
10:21	4.93	11:16	4.94	12:06	5.08	12:56	5.42	13:46	4.94
10:22	4.92	11:17	4.94	12:07	5.05	12:57	5.41	13:47	4.95
10:23	4.90	11:18	4.93	12:08	5.03	12:58	5.38	13:48	4.95
10:24	4.91	11:19	4.93	12:09	5.08	12:59	5.36	13:49	4.97
10:25	4.94	11:20	4.94	12:10	5.08	13:00	5.35	13:50	4.93
10:26	5.00	11:21	4.90	12:11	5.06	13:01	5.35	13:51	4.93
10:27	4.93	11:22	4.93	12:12	5.10	13:02	5.30	13:52	4.94
10:28	4.89	11:23	4.92	12:13	5.10	13:03	5.26	13:53	4.93
10:29	4.93	11:24	4.87	12:14	5.10	13:04	5.21	13:54	4.94
10:30	4.93	11:25	4.88	12:15	5.11	13:05	5.12	13:55	4.90
10:31	4.95	11:26	4.91	12:16	5.11	13:06	5.05	13:56	4.92
10:32	4.90	11:27	4.89	12:17	5.13	13:07	5.01	13:57	4.91
10:33	4.85	11:28	4.89	12:18	5.18	13:08	4.97	13:58	4.90
10:34	4.84	11:29	4.93	12:19	5.23	13:09	4.94	13:59	4.91
10:35	4.81	11:30	4.93	12:20	5.22	13:10	4.93	14:00	4.92
10:36	4.83	11:31	4.90	12:21	5.24	13:11	4.95	14:01	4.87
10:37	4.88	11:32	4.94	12:22	5.28	13:12	4.94	14:02	4.90
10:38	4.88	11:33	4.97	12:23	5.29	13:13	4.91	14:03	4.86
10:39	4.95	11:34	4.96	12:24	5.28	13:14	4.95	14:04	4.87
10:40	4.96	11:35	4.94	12:25	5.25	13:15	4.90	14:05	4.84
10:41	4.98	11:36	4.93	12:26	5.24	13:16	4.93	14:06	4.87
10:42	4.94	11:37	4.93	12:27	5.27	13:17	4.96	14:07	4.89
Avg.	4.90	Avg.	4.97	Avg.	5.10	Avg.	5.25	Avg.	4.92

Airgas Specialty Gases
Airgas USA, LLC
400 Union Landing Road
Channahon, IL 60917-0000
Airgas.comCERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04N199E15A0440 Reference Number: 82-401123105-1
 Cylinder Number: N033083 Cylinder Volume: 247.2 CF
 Laboratory: 124 - Plumsteadville - PA Valve Pressure: 2215 PSIG
 PGVP Number: 650218 Valve Outlet: 660
 Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 26, 2018
 Expiration Date: Feb 26, 2025

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/6-12/051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total assay/opacity uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volumetric basis unless otherwise noted.

Do Not Use This Cylinder Below 100 psig, i.e. 6.7 megapascals

Component		Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX		80.00 PPM	80.41 PPM	G1	+/- 1.5% NIST Traceable	02/16/2018, 02/26/2018
CARBON MONOXIDE		80.00 PPM	80.31 PPM	G1	+/- 0.7% NIST Traceable	02/16/2018
NITRIC OXIDE		80.00 PPM	80.39 PPM	G1	+/- 1.0% NIST Traceable	02/16/2018, 02/26/2018
SULFUR DIOXIDE		80.00 PPM	81.81 PPM	G1	+/- 1.2% NIST Traceable	02/16/2018, 02/26/2018
NITROGEN		Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	1490705	CC43493	49.89 PPM CARBON MONOXIDE/NITROGEN	+/- 0.8%	Feb 22, 2020
PRM	13497	APR108827	8.83 PPM NITROGEN DIOXIDE/AR	+/- 2.0%	Jun 16, 2017
NTRM	1802607	CC42854	80.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
QMS	011021004	CC53355	4.875 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Mar 16, 2019
NTRM	14911025	CC47214	48.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 07, 2022

The SRM, PRM or QMS noted above is only for reference to the GMS used in the assay and not part of the analysis.

Triad Data Available Upon Request

NOTES:

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/051. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. We are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.

ACCREDITED
TESTING CERT No. 3062.05

Approved for Release

Page 1 of 02-401123105-1

Airgas Specialty Gases
Airgas USA, LLC
614 Easton Road
Bldg. 1
Plumsteadville, PA 19449
Airgas.comCERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04N199E15A0440 Reference Number: 160-401907847-1
 Cylinder Number: E0137377 Cylinder Volume: 144.4 Cubic Feet
 Laboratory: 124 - Plumsteadville - PA Valve Pressure: 2015 PSIG
 PGVP Number: A12020 Valve Outlet: 660
 Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Oct 06, 2020
 Expiration Date: Oct 06, 2028

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/6-12/051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total assay/opacity uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volumetric basis unless otherwise noted.

Do Not Use This Cylinder Below 100 psig, i.e. 6.7 megapascals

Component		Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX		80.00 PPM	80.27 PPM	G1	+/- 1.4% NIST Traceable	06/29/2020, 10/06/2020
CARBON MONOXIDE		80.00 PPM	80.53 PPM	G1	+/- 1.2% NIST Traceable	06/29/2020
NITRIC OXIDE		80.00 PPM	80.27 PPM	G1	+/- 1.4% NIST Traceable	06/29/2020, 10/06/2020
SULFUR DIOXIDE		80.00 PPM	79.00 PPM	G1	+/- 1.0% NIST Traceable	06/29/2020, 10/06/2020
NITROGEN		Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11010130	KAL004536	97.31 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Oct 04, 2022
PRM	12386	D655025	9.81 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
NTRM	17060226	E06079109	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
QMS	124206689	CC323707	4.928 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 16, 2021
NTRM	07060227	E06079116	100.6 PPM NO/NITROGEN	+/- 1.0%	Jul 23, 2023
NTRM	16010235	KAL004419	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	11010416	KAL004302	99.6 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.9%	Jul 28, 2023

The SRM, PRM or QMS noted above is only for reference to the GMS used in the assay and not part of the analysis.

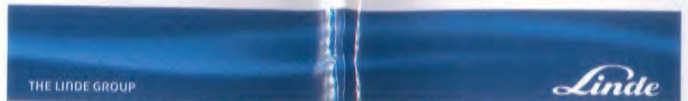
Triad Data Available Upon Request

NOTES: Gross Weight: 27.8 Kg Net Weight: 4.6 Kg.



Approved for Release

Page 1 of 160-401907847-1



CERTIFICATE OF ANALYSIS

Customer Detail: ALS Laboratory Group (Thailand)		Production Order Number: 90132928 Material Number: 478100-J-44 Certification Date: 20-Jan-2016 Expiry Date: 20-Jan-2024
Cylinder Description: Std 47.1		The measurement of this reference material is traceable to SI through the above standard which is traceable to Swiss National Standard of Mass. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/051 for the Assay and Certification of Gaseous Calibration Standards using procedure G1. The results are expressed on a mole/mole basis, unless otherwise specified. The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k=2, providing a level of confidence of approximately 95%.
Certificate Number: 4676/15	Analyst: THIRAT LOYRAT	
Cylinder Number: 850730	Approver: SUKANYA KAMUTHARAT	
Nominal Cylinder Content: 6.520 M ³	To Re-Order Please Quote: 478100-J-44	
Nominal Pressure: 145.0 Bar		
Valve Outlet: CGA 590 BRASS		
Comment:	<ul style="list-style-type: none"> It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig. Other impurities not detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component. Keep and use in well-ventilated and secure area. 	

Page 1 of 2

Linde (Thailand) Public Company Limited

157 Floor, Bangkok Tower A, 279 Moo 14, Bangna-Trad Rd. 6.5 Road, Bangnae
 Bangkok, Samprakan 10540, Tel (66) 2336-4100 Fax (66) 2336-4333
 Wulphart Plant: 105 Moo 5, Lamphong, A Road, Bangkok, Chonburi 24100
 Thailand, Tel (66) 38370-479-93 Fax (66) 38370-1223

Linde (Thailand) Public Company Limited

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 Wulphart Plant: 105 Moo 5, Lamphong, A Road, Bangkok, Chonburi 24100
 Thailand, Tel (66) 38370-479-93 Fax (66) 38370-1223

CERTIFICATE OF ANALYSIS

Analytical Result

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

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Oxygen in Nitrogen	24362SSG	25.08 ± 0.13 %	19-Aug-2017

Analytical Instruments used in Assay

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

Method of Analysis

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

Cylinder Number: 850730
Production Order Number: 90132928

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

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

Head Office: 15/15 Moo 14, Bangna-Trad Rd., 6.5 Road, Bangkok
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Tel: (66) 38-570-479-93 Fax: (66) 38-570-323

CERTIFICATE OF ANALYSIS

Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Oxygen in Nitrogen	16.0 %	16.0 %	± 1% relative	(2) I-PB-354	24-Sep-2016

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Oxygen in Nitrogen	24362SSG	25.08 ± 0.13 %	19-Aug-2017

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Servomex 4100 O2 Analyzer	Paramagnetic	24-Sep-2016

Method of Analysis

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

Cylinder Number: 363075
Production Order Number: 90137389

Certification Date: 24-Sep-2016
Expiration Date: 24-Sep-2024

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CERTIFICATE OF ANALYSIS

Customer Details: ALS Laboratory Group (Thailand)		Production Order Number: 90137389 Material Number: 557200-J-44 Certification Date: 24-Sep-2016 Expiry Date: 24-Sep-2024	
Cylinder Description: STEEL 47 L			
The measurement of this reference material is traceable to SI through the reference standard which is traceable to Swiss National Standard of the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gas Calibration Standards using procedure C1. The results are expressed on a mole/mole basis, unless otherwise specified. The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k=2, providing a level of confidence of approximately 95%.		Analyst:  THITIRAT LOYRAT	
Certificate Number: 2857/16		Analyst:	
Cylinder Number: 363075		Approve:  SUKANYA KAMUTHARAT	
Nominal Cylinder Content: 6,560 M³		To Re-Order Please Quote: 557200-J-44	
Nominal Pressure: 145.0 Bar			
Valve Outlet: CGA 590 BRASS			
Comment: ● It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psi. ● Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component. ● Keep and use in well-ventilated and secure area.			

Page 1 of 2

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Tel: (66) 38-570-479-93 Fax: (66) 38-570-323



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 13-Jan-23
Next Cal. Date : 13-Jul-23
Barometric Pressure (mmHg) : 760
Relative Humidity (%) : 55.0
Temperature (C°) : 30.0
Reference Dry Gas Meter Data
Reference Dry Gas Meter ID : BKK-FS1122
Serial No. : A2003240
Correction Factor (Y) : 1.0160
Next Calibration Date : 05/27/23

ΔH (mm-H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration				Console Control Dry Gas Meter						Dry Gas Meter Correction Factor	Orifice Calibration Factor
		Vr (Liters)		Tr (°C)		Vm (Liters)		Ti (°C)		To (°C)	Avg.Tm (°C)		
		Final	Initial	Final	Initial	Final	Initial	Final	Initial				
15	12.56	150.00	0.00	150.00	31.0	311.219.8	311.064.0	155.80	29.0	29.0	29.0	0.9763	48.7405
25	9.48	150.00	0.00	150.00	31.0	311.279.6	311.225.0	154.40	29.0	29.0	29.0	0.9769	48.2782
50	6.58	150.00	0.00	150.00	30.0	311.544.0	311.360.0	154.00	29.0	29.0	29.0	0.9816	44.2975
80	5.16	150.00	0.00	150.00	30.0	311.708.6	311.555.0	153.60	30.0	30.0	30.0	0.9846	43.4421
120	4.16	150.00	0.00	150.00	30.0	311.867.8	311.715.0	152.80	30.0	30.0	30.0	0.9859	42.3505
												0.9759	46.0224

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

ΔH_g Orifice pressure differential that equates to 21.24 in of air @ 25°C and 760 mm of mercury; mmH₂O tolerance for individual values ± 5.08 from average.

Procedure: 40 CFR 60, APP A METH, SEC 5.8 & 7

Calibrated by: Sakit Poonvith

(Mr. Sakit Poonvith)

Approved by:

Nattaporn Jangwanong

(Ms. Nattaporn Jangwanong)

Field Specialist(1)

FORM NO. L-1-06-024 REVISION NO. 2 ISSUE DATE: 30 Jan 22



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0522 Calibration Date : 13 Jan 23
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-130123-BKK_FS0522 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 2	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 3	A	12.00	16.80	0.845	-
	B	12.00	16.80	-	0.845
\bar{C}_p				0.842	0.842

$$Cp(S) = C_{p\text{std}} \sqrt{\frac{\Delta P(\text{std})}{\Delta P(s)}}$$

$$|C_{p(A)} - C_{p(B)}| \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum_i [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

Saksit Phaisanphiset

(Mr. Saksit Phaisanphiset)
Field Scientist (4)

Approved by

Nattapong Jengwarewong

(Mr.Nattapong Jengwarewong)
Specialist (1)

FORM NO.: F 06-025 REVISION NO.: 1 ISSUE DATE: 30 Jun 22



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0523 Calibration Date : 13 Jan 23
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-130123-BKK_FS0523 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 2	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 3	A	12.00	16.80	0.845	-
	B	12.00	16.80	-	0.845
\bar{C}_p				0.842	0.842

$$Cp(S) = C_{p\text{std}} \sqrt{\frac{\Delta P(\text{std})}{\Delta P(s)}}$$

$$|C_{p(A)} - C_{p(B)}| \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum_i [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

Saksit Phaisanphiset

(Mr. Saksit Phaisanphiset)
Field Scientist (4)

Approved by

Nattapong Jengwarewong

(Mr.Nattapong Jengwarewong)
Specialist (1)

FORM NO.: F 06-025 REVISION NO.: 1 ISSUE DATE: 30 Jun 22



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 13 Jan 23	Ambient Temperature (°C) 30
Calibration sheet No. : C-130123-BKK_FS0519	Relative Humidity (%) : 55
Digital Temperature ID : BKK_FS0519	Reference Temperature ID : BKK_FS0609
Console Serial No. : 1504025	Serial No. : 7688004
Model : XC-572-V	Model : FLUKE 714
	Last Calibrate : 25 Jan 22

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	25	0	
	50	50	0	
	100	100	0	
	150	150	0	
	200	200	0	
	250	250	0	
	300	300	0	
	500	500	0	
	1000	1001	1	
Probe	1200	1201	1	
	100	100	0	
	120	120	0	
	140	140	0	
Filter	100	100	0	
	120	120	0	
Exit	140	140	0	
	0	0	0	
	10	10	0	
Meter	20	20	0	
	0	0	0	
	25	25	0	
	50	50	0	
	AUX	0	0	
	25	25	0	
	50	50	0	

Calibrated by

Saksit Phaisanphiset

Mr. Saksit Phaisanphiset
Field Scientist (4)

Approved by

Nattapong Jengwarewong

Mr.Nattapong Jengwarewong
Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 1 ISSUE DATE: 2/5/02



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 13 Jan 23	Nozzle Set ID. : BKK_FS0524
Calibration Sheet No. : C-130123-BKK_FS0524	Vernier Caliper ID. : BKK_FS1123

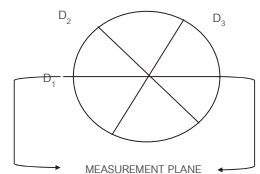
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
	D_1	D_2	D_3		
1	0.318	0.318	0.318	0.000	0.318
2	0.472	0.474	0.475	0.003	0.474
3	0.632	0.635	0.634	0.003	0.634
4	0.792	0.792	0.792	0.000	0.792
5	0.952	0.952	0.952	0.000	0.952
6	1.091	1.110	1.092	0.019	1.098
7	1.256	1.262	1.262	0.006	1.260
8	1.601	1.598	1.600	0.003	1.600

Where :

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

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

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



Calibrated by

Saksit Phaisanphiset

(Mr. Saksit Phaisanphiset)
Field Scientist (4)

Approved by

Nattapong Jengwarewong

(Mr.Nattapong Jengwarewong)
Field Specialist (1)

FORM NO.: F 06-028 REVISION NO.: 1 ISSUE DATE: 9/5/02



Certificate No.: G 660002
Date of issue : 03-Jan-23

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 62985047
ID no. or control no. : RYG_F50563
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 3 Pages
Receiving no. : L-230002
Receiving date : 27-Dec-22
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.04,21.02 %Vol, Carbon Monoxide 80.14,309.9,1003 ppm,
Nitrogen Dioxide 30.34,80.96,202.2 ppm, Nitric Oxide 30.08,150.9,320.6 ppm,
Sulphur Dioxide 50.04,100.8,601.1 ppm)
Condition of UUC : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toonsongkhong, Lakki, Bangkok 10210
Calibration procedure no. : WI-CL-28-C

REVIEW BY : *Marlene P.*
APPROVED BY : *[Signature]*
NEXT CAL. DATE : 28/12/23

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).
Date of calibration : 28-Dec-22

Mr. Sedawut Nueathong
Calibration Technician
Mrs. Nongluck Wongsettee
Technical Manager



Certificate No.: G 660002

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimt.	18-Nov-27
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt.	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0010-22	Nimt.	14-Feb-27
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2583/22	Linde	09-Aug-24
Nitrogen Dioxide (NO2) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO2) 80.96 ppm	2041/22	Linde	26-Jun-24
Nitrogen Dioxide (NO2) 202.2 ppm	3239/21	Linde	20-Jul-23
Nitric Oxide (NO) 30.08 ppm	CG-0089-22	Nimt.	13-Jun-24
Nitric Oxide (NO) 150.9 ppm	3857/21	Linde	27-Jun-23
Nitric Oxide (NO) 320.6 ppm	2944/21	Linde	02-Jul-23
Sulphur Dioxide (SO2) 50.04 ppm	3206/21	Linde	25-Jul-23
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 601.1 ppm	3204/21	Linde	20-Jul-23

Measured room conditions

Temperature : 23.5 °C Humidity : 58.6 %RH Pressure : 1015.2 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1021.2 mbar

Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.44	-0.058	0.20
O2 (%Vol)	10.04	9.91	-0.13	0.40
O2 (%Vol)	21.02	21.14	0.12	0.80
CO (ppm)	80.14	80	-0.14	3.0
CO (ppm)	309.9	309	-0.9	6.0
CO (ppm)	1003	1001	-2	12
NO2 (ppm)	30.34	20.8	-9.54	8.0
NO2 (ppm)	80.96	62.1	-18.86	8.0
NO2 (ppm)	202.2	176.8	-25.4	12
NO (ppm)	30.08	29	-1.08	8.0
NO (ppm)	150.9	149	-1.9	8.0
NO (ppm)	320.6	318	-2.6	12
SO2 (ppm)	50.04	45	-5.04	6.0
SO2 (ppm)	100.8	95	-5.9	6.0
SO2 (ppm)	601.1	568	-33.1	13



Certificate No.: G 660002

Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.44	-0.058	0.20
O2 (%Vol)	10.04	9.91	-0.13	0.40
O2 (%Vol)	21.02	21.14	0.12	0.80
CO (ppm)	80.14	80	-0.14	3.0
CO (ppm)	309.9	309	-0.9	6.0
CO (ppm)	1003	1001	-2	12
NO2 (ppm)	30.34	29.2	-1.14	8.0
NO2 (ppm)	80.96	81.4	0.44	8.0
NO2 (ppm)	202.2	205.8	3.6	12
NO (ppm)	30.08	29	-1.08	8.0
NO (ppm)	150.9	149	-1.9	8.0
NO (ppm)	320.6	318	-2.6	12
SO2 (ppm)	50.04	49	-1.04	6.0
SO2 (ppm)	100.8	101	0.2	6.0
SO2 (ppm)	601.1	604	2.9	13

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

End of Report

RYG_EN0003

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2543 8361-6, e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

REVIEW BY : *Thawit*
APPROVED BY : *[Signature]*
NEXT CAL. DATE : 01/08/24

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

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

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

Calibrated By : Mr.Chonchai Inthana
Calibration Date : Wednesday, March 01, 2023
Calibration Procedure No. : This calibration was conducted by Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14 : 2019

Metrological data : Capacity : 220 g Readability : 0.0001 g
Ambients Conditions : Temperature : 23.0 °C ± 5.0 °C
Humidity : 58.0 % RH ± 10.0 % RH
Pressure : ±

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

Measurement Method UKAS Publication Ref : Lab 14

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

Traceability:

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

This certificate relate and apply this equipment only.

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



Certificate of Calibration

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

Calibration Results : Without Adjustment

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

Linearity				
The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.				
Tolerance	0.0002	g		
Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00013
0.05	0.0500	0.0500	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
0.5	0.5000	0.5000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00024
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	200.0001	0.0001	0.00032

End of Report

SOP FM 33 03 February 2022



DRY GAS METER CALIBRATION TEST REPORT

Calibration Date : 13-Jan-23
Next Calibration Date : 13-Jul-23
Barometric Pressure (mm.Hg) : 760
Relative Humidity (%) : 55.0
Temperature (°C) : 30.0
Dry Gas Meter Data
Calibration sheet No. : C-130123-BKK_FS0525
Dry Gas Meter ID : BKK_FS0525
Serial No. : 1302005
Model No. : XC-60C-V
Reference Dry Gas Meter ID : BKK_FS1122
Serial No. : A2003240
Correction Factor (Y) : 1.0160
Next Calibration Date : 27 May 23

Reference Dry Gas Meter Calibration				Dry Gas Meter					Dry Gas Meter Correction Factor (Y)
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	
Final	Initial	Total		Final	Initial	Total			
30.00	0.00	30.00	24.0	30.84	0.00	30.84	25.0	25.0	0.9917
30.00	0.00	30.00	25.0	30.92	0.00	30.92	26.0	26.0	0.9891
60.00	0.00	60.00	26.0	62.26	0.00	62.26	27.0	27.0	0.9824
60.00	0.00	60.00	28.0	62.38	0.00	62.38	29.0	29.0	0.9805
90.00	0.00	90.00	29.0	93.30	0.00	93.30	30.0	30.0	0.9833
90.00	0.00	90.00	29.0	93.34	0.00	93.34	30.0	30.0	0.9829
Avg.									0.9850

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

Calibrate by :

Mr. (Tinnakorn Kulchart)
Field Scientist (1)

Approved by :

Mr. (Nathapol Jiengwareewong)
Specialist (1)

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



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	13 Jan 23	Ambient Temperature (°C)	30		
Calibration sheet No. : C-130123-BKK_FS0525		Relative Humidity (%) :	55		
Digital Temperature ID : BKK_FS0525		Reference Temperature ID	BKK_FS0609		
Serial No. : 1606011		Serial No. :	7688004		
Model : XC-62-CV		Model :	FLUKE714		
		Next Calibrate :	25 Jul 23		
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	1	1	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass
	100	101	1	±3	Pass
	150	151	1	±3	Pass
	200	201	1	±3	Pass
	250	251	1	±3	Pass
	300	301	1	±3	Pass
Probe	500	501	1	±3	Pass
	100	101	1	±3	Pass
	120	120	0	±3	Pass
	140	141	1	±3	Pass
Oven	100	-	-	±3	-
	120	-	-	±3	-
	140	-	-	±3	-
Filter	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของค่าวัดที่อนุญาต

Calibrated by :

Mr. Saksit Phaisanphit
Field Scientist (4)

Approved by :

Mr. Nathapol Jiengwareewong
Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 2 ISSUE DATE: 9 Feb 23



Rotameter Calibration Report

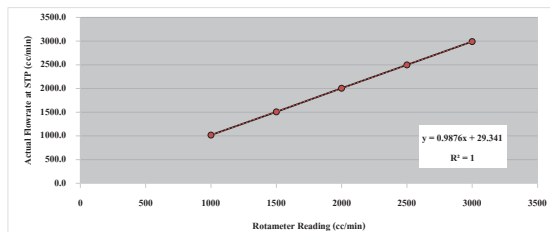
Calibration Date : 13 Jan 23
Rotameter ID : BKK_FS0526
Calibration Sheet No : C-130123-BKK_FS0526
Relative Humidity (%) : 55.0
Barometric Pressure (mmHg) : 760
Temperature (°C) : 30.0

Primary Equipment Data

Brand : Bios
Model : Defender 520 M
Serial No. : 129958
ID : RYG_FS0209

Calibration Data

Rotameter Reading(cc/min)	Actual Flowrate (cc/min)				Actual Flowrate at STP (cc/min)
	1	2	3	Avg.	
1000	1036.0	1035.2	1034.6	1035.3	1018.2
1500	1532.5	1534.1	1535.0	1533.9	1508.5
2000	2037.0	2040.2	2039.2	2038.8	2005.1
2500	2541.0	2542.1	2540.1	2541.1	2499.1
3000	3040.1	3042.3	3044.1	3042.2	2991.9



Calibrated by :

(Mr. Tinnakorn Kulchart)
Field Scientist (1)

Approved by :

(Mr. Nathapol Jiengwareewong)
Field Specialist (1)

Form 281-012 (27/02/2020)



Certificate of Calibration

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

Certificate No.: C06220464
Issued Date: 27 September 2022
Job No.: KSPR2212224
Page: 1 of 3

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

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

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

Calibration By: Mr. Chattuphon Fothong
Calibration Date: 27 September 2022
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starra Scientific Limited.

The standard for Wavelength Certificate No. 91418 and 91435
The standard for Photometric Certificate No. 91441 and 101088
The standard for Stray light Certificate No. 101041 and 101040
The standard for Spectral resolution Certificate No. 101037

(Mr. Chattuphon Fothong)
Person in charge

(Mr. Thalerngkiet Pongngam)
Authorized signatory

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

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

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

DKSH Technology Limited
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2533 Subharnul Road, Bangnai, Prachinburi, Bangkok 10280
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - In Asia and Beyond.

CALFM-C06-13: 20 Jul 2022

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.51	418.4	0.21	0.14	
536.66	536.7	-0.04	0.14	
637.98	638.3	-0.32	0.14	
748.48	748.8	-0.32	0.14	
807.03	807.4	-0.37	0.13	

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5605	0.563	-0.0025	0.0045
	0.7334	0.737	-0.0036	0.0045
	1.0534	1.057	-0.0036	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5503	0.553	-0.0027	0.0045
	0.7179	0.720	-0.0021	0.0045
	1.0312	1.034	-0.0028	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5024	0.506	-0.0036	0.0045
	0.6693	0.672	-0.0027	0.0045
	0.9604	0.964	-0.0036	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5168	0.519	-0.0022	0.0045
	0.6903	0.691	-0.0007	0.0045
	0.9804	0.982	-0.0016	0.0045
580 nm	0.0000	0.000	0.0000	0.0045
	0.5525	0.554	-0.0015	0.0045
	0.7175	0.718	-0.0005	0.0045
	1.0301	1.031	-0.0009	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5367	0.538	-0.0013	0.0045
	0.6847	0.685	-0.0003	0.0048
	0.9823	0.983	-0.0007	0.0045

DKSH Technology Limited
2533 หมู่ 5 ตำบลบ้านใหม่ อำเภอวังจันทร์ จังหวัดระยอง 21080
2533 Subharnul Road, Bangnai, Prachinburi, Bangkok 10280
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CALFM-C06-13: 20 Jul 2022

Calibration Results:
Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7423	0.744	-0.0017	0.0083
257 nm	0.0000	0.000	0.0000	0.0080
	0.8609	0.861	-0.0001	0.0084
313 nm	0.0000	0.000	0.0000	0.0080
	0.2895	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6381	0.638	0.0001	0.0080

Stray light *			
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.67 +/- 0.11 nm	260.7	2.1	1.678
391.94 +/- 0.11 nm	391.9	1.7	1.770

Spectral Resolution *				
Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.60	266.63	1.39	2.60
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4610	0.3176		
Absorbance (A)	0.373	0.268		

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

The End of Certificate

DKSH Technology Limited
2533 หมู่ 5 ตำบลบ้านใหม่ อำเภอวังจันทร์ จังหวัดระยอง 21080
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CALFM-C06-13: 20 Jul 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องมือ: SPECTROPHOTOMETER		รุ่น: DR6000	หมายเลขเครื่อง: 1627845		
ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ถึง)		หมายเหตุ
27 Sep 2022			27 Sep 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวคูณเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	656.1 นาโน 656.1 nm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แสงกัมมันตภาพ (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แสงกัมมันตภาพ (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องใส่ตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่น้อย 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาวะ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เงื่อนไขข้อควรระวัง:

Mr. Chattuphon Fothong
Service Engineer

DKSH Technology Limited
2533 หมู่ 5 ตำบลบ้านใหม่ อำเภอวังจันทร์ จังหวัดระยอง 21080
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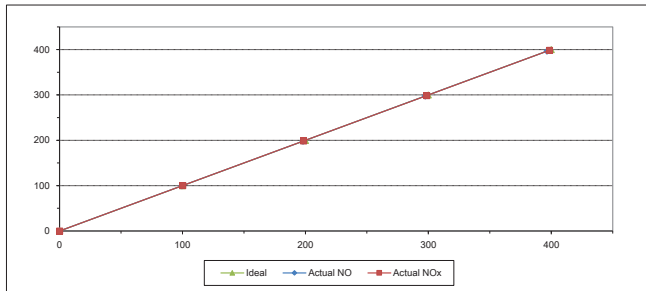
CAL-FM-R31-03: 20 Jul 2022



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2197	Equipment ID	RYG_FS0255
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	100.20	0.20	0.20
2	200.00	198.10	-1.90	-0.95	198.50	-1.50	-0.75
3	300.00	297.50	-2.50	-0.83	298.70	-1.30	-0.43
4	400.00	396.50	-3.50	-0.88	398.60	-1.40	-0.35
AVERAGE (%)				-0.59			-0.25



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

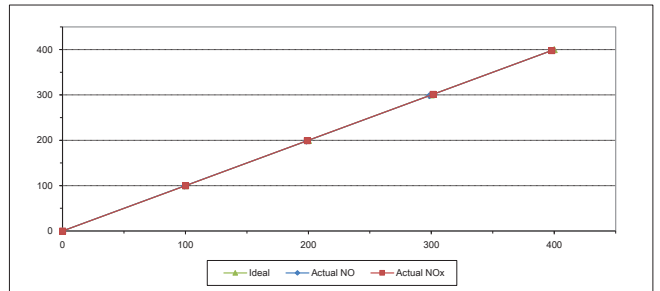
ALS Laboratory Group
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MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	8G314J3K	Equipment ID	RYG_FS0264
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	100.10	0.10	0.10
2	200.00	198.40	-1.60	-0.80	199.10	-0.90	-0.45
3	300.00	298.60	-1.40	-0.47	301.50	1.50	0.50
4	400.00	398.10	-1.90	-0.47	398.00	-2.00	-0.50
AVERAGE (%)				-0.50			-0.05



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

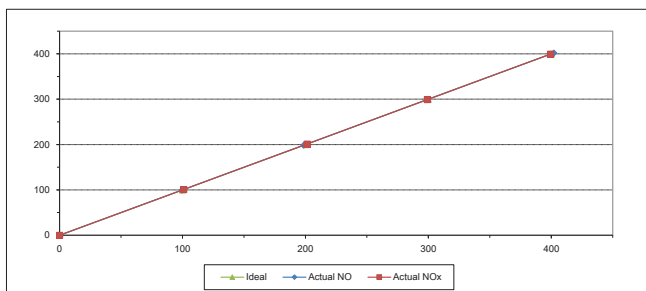
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	H73KYD1M	Equipment ID	BKK_FS0797
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.00	1.00	1.00
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	299.00	-1.00	-0.33	299.20	-0.80	-0.27
4	400.00	402.10	2.10	0.53	399.50	-0.50	-0.13
AVERAGE (%)				-0.14			0.27



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

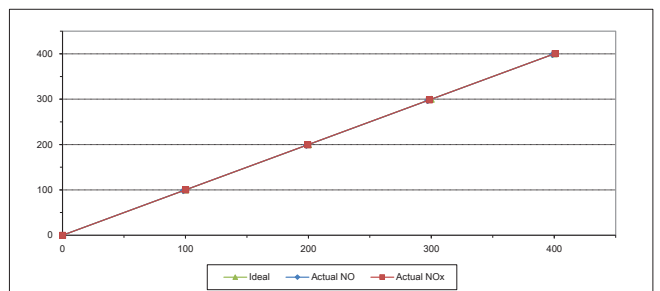
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MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	T2T8YRLL	Equipment ID	RYG_FS0457
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.30	-1.70	-1.70	100.20	0.20	0.20
2	200.00	198.40	-1.60	-0.80	199.60	-0.40	-0.20
3	300.00	297.10	-2.90	-0.97	298.50	-1.50	-0.50
4	400.00	398.60	-1.40	-0.35	400.70	0.70	0.17
AVERAGE (%)				-0.74			-0.05



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

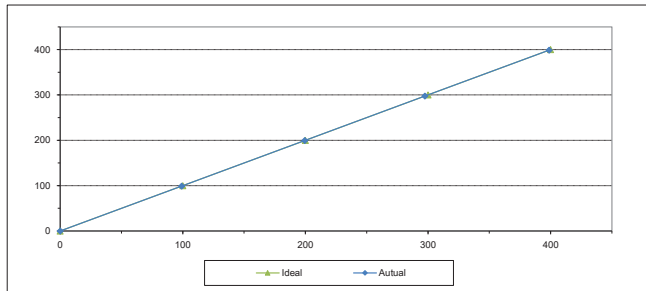
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1772	Equipment ID	RYG_FS0254
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90
2	200.00	199.50	-0.50	-0.25
3	300.00	297.50	-2.50	-0.83
4	400.00	398.80	-1.20	-0.30
AVERAGE (%)				-0.45



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

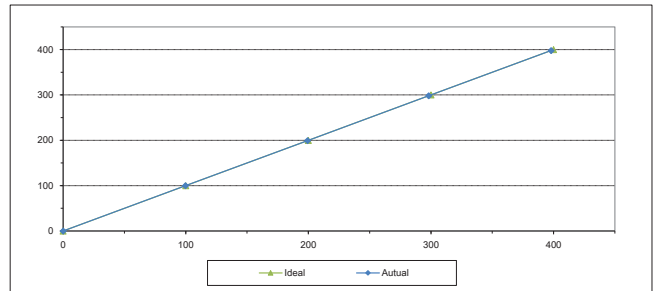
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FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	YPRXJJ20	Equipment ID	RYG_FS0263
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.80	-0.20	-0.20
2	200.00	199.40	-0.60	-0.30
3	300.00	298.20	-1.80	-0.60
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				-0.30



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

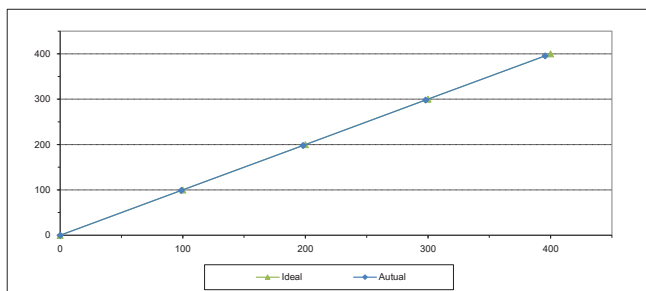
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MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	G2CH436B	Equipment ID	BKK_FS0796
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.91	-1.09	-1.09
2	200.00	198.10	-1.90	-0.95
3	300.00	298.10	-1.90	-0.63
4	400.00	395.60	-4.40	-1.10
AVERAGE (%)				-0.74



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

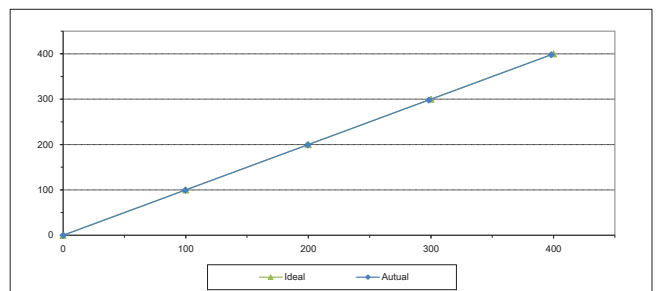
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MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	R0HWYDVW	Equipment ID	RYG_FS0456
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30
2	200.00	199.50	-0.50	-0.25
3	300.00	298.30	-1.70	-0.57
4	400.00	398.10	-1.90	-0.47
AVERAGE (%)				-0.30



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

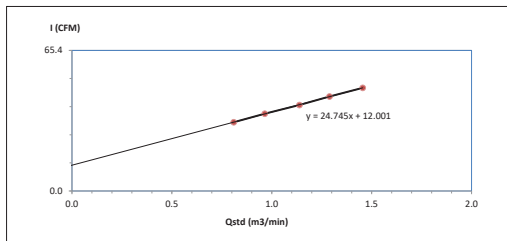
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High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : กรุงเทพมหานคร
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0399
Calibrator ID: RYG_FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0399
High Volume Model : TE-5009X
High Volume S/N : 5683
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.4	0.8096	32	Slope : 24.7449 Intercept : 12.0006 Correlation Coefficient : 0.9998
2	2.0	0.9647	36	
3	2.8	1.1387	40	
4	3.6	1.2892	44	
5	4.6	1.4553	48	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

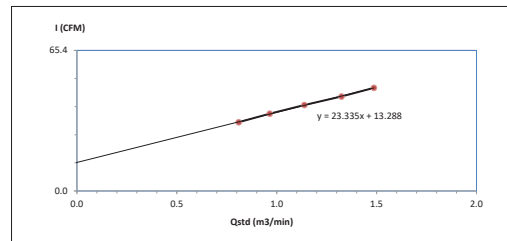
FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : กรุงเทพมหานคร
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0190
Calibrator ID: RYG_FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0190
High Volume Model : G1051
High Volume S/N : 1625
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.4	0.8096	32	Slope : 23.3354 Intercept : 13.2879 Correlation Coefficient : 0.9996
2	2.0	0.9647	36	
3	2.8	1.1387	40	
4	3.8	1.3241	44	
5	4.8	1.4863	48	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

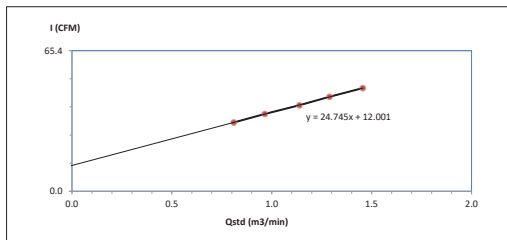
FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : กรุงเทพมหานคร
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0184
Calibrator ID: RYG_FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0184
High Volume Model : TE-5009X
High Volume S/N : 4792
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.4	0.8096	32	Slope : 24.7449 Intercept : 12.0006 Correlation Coefficient : 0.9998
2	2.0	0.9647	36	
3	2.8	1.1387	40	
4	3.6	1.2892	44	
5	4.6	1.4553	48	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

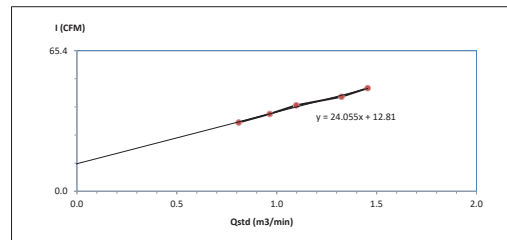
FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : กรุงเทพมหานคร
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0186
Calibrator ID: RYG_FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0186
High Volume Model : TE-5009X
High Volume S/N : 4794
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.4	0.8096	32	Slope : 24.0545 Intercept : 12.8105 Correlation Coefficient : 0.9964
2	2.0	0.9647	36	
3	2.6	1.0979	40	
4	3.8	1.3241	44	
5	4.6	1.4553	48	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

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

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



SARTORIUS



Certificate of Calibration

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

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

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

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

Metrological data:
Capacity: 150 g Readability: 0.0001 g
Reasons for calibration:
☐ New Installation ☐ Service / Repair ☒ Re-calibration / Maintenance
Ambients Conditions:
Temperature: 24.2 °C ± 5.0 °C
Humidity: 60.0 % RH ± 10.0 % RH
Pressure: ±
Equipment Condition: ☒ Good Operate ☐ Fair

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

Traceability:

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

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

Mr. Chonchai Inthana (Technical Manager)
SARTORIUS
ISO/IEC 17025:2017

SOP FM 33 03 February 2022

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

SARTORIUS

Certificate of Calibration

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

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The reproducibility is the ability of a weighing instrument to display nearly identical readings under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.	The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R113).
Nominal Value : (Low Load) 10 g Tolerance 0.0001 g	Nominal value: 50 g Tolerance 0.0004 g
Nominal Value : (High Load) 100 g Tolerance 0.0001 g	Difference 1 - 2 0.0000 3 -0.0001 4 0.0001 5 0.0006 6 -
Standard Deviation 0.00009 0.00006	

Linearity

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

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

End of Report

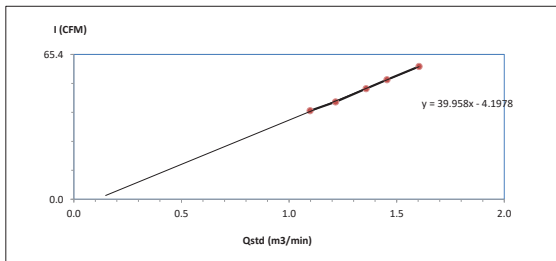
SOP FM 33 03 February 2022



High Volume Air Sampler Calibration Worksheet

Project Site: Global Power Synergy Public Company Limited
Calibrate Location: บ้านประจักษ์ศิลปาคม
Calibrate Date: 1-Mar-23
CalibrationSheet No.: C-010323-RYG-FS0396
Calibrator ID: RYG-FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg): 760
Temperature (°C): 31
High Volume ID: RYG-FS0396
High Volume Model: TE-5170D
High Volume S/N: 5688
Calibrator Slope: 1.47433
Calibrator Intercept: -0.01503

Test No.	Delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0979	40	Slope: 39.9579
2	3.2	1.2163	44	Intercept: -4.1978
3	4.0	1.3581	50	Correlation Coefficient: 0.9994
4	4.6	1.4553	54	
5	5.6	1.6042	60	



Calibrated by: Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

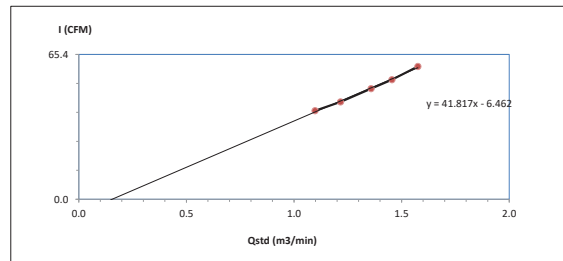
Approved by: (Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site: Global Power Synergy Public Company Limited
Calibrate Location: บ้านประจักษ์ศิลปาคม
Calibrate Date: 1-Mar-23
CalibrationSheet No.: C-010323-RYG-FS0181
Calibrator ID: RYG-FS0206
Calibrator Model: TE-5028A
Calibrator S/N: 1543
Barometric Pressure (mm Hg): 760
Temperature (°C): 31
High Volume ID: RYG-FS0181
High Volume Model: TE-5170D
High Volume S/N: 5334
Calibrator Slope: 1.47433
Calibrator Intercept: -0.01503

Test No.	Delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0979	40	Slope: 41.8175
2	3.2	1.2163	44	Intercept: -6.4620
3	4.0	1.3581	50	Correlation Coefficient: 0.9979
4	4.6	1.4553	54	
5	5.6	1.5756	60	



Calibrated by: Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

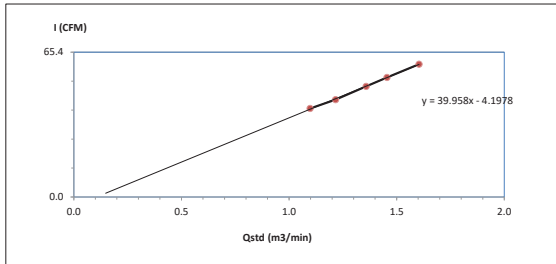
Approved by: (Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : วัดเขาหลักท่ง
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0395
Calibrator ID: RYG_FS0206
Calibrator Model : TE-5028A
Calibrator S/N : 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0395
High Volume Model : TE-5170D
High Volume S/N : 5692
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0979	40	Slope : 39.9579 Intercept : -4.1978 Correlation Coefficient : 0.9994
2	3.2	1.2163	44	
3	4.0	1.3581	50	
4	4.6	1.4553	54	
5	5.6	1.6042	60	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : [Signature]
(Mr. Noppog Juntarupan)
Enviro Field Coordinator Scientist (3)

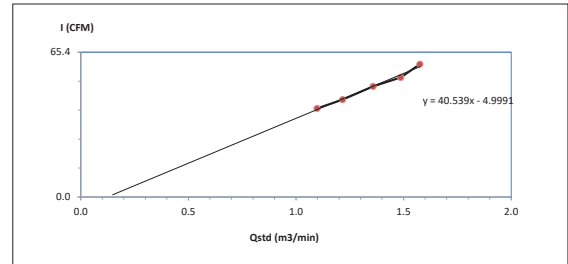
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Global Power Synergy Public Company Limited
Calibrate Location : วัดเขาหลักท่ง
Calibrate Date : 1-Mar-23
CalibrationSheet No.: C-010323-RYG_FS0291
Calibrator ID: RYG_FS0206
Calibrator Model : TE-5028A
Calibrator S/N : 1543
Barometric Pressure (mm Hg) : 760
Temperature (°C) : 31
High Volume ID : RYG_FS0291
High Volume Model : TE-5170D
High Volume S/N : 5333
Calibrator Slope : 1.47433
Calibrator Intercept : -0.01503

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0979	40	Slope : 40.5389 Intercept : -4.9991 Correlation Coefficient : 0.9936
2	3.2	1.2163	44	
3	4.0	1.3581	50	
4	4.8	1.4863	54	
5	5.4	1.5756	60	



Calibrated by : Mongkon Ph.
(Mr. Mongkon Phalathip)
Field Scientist(1)

Approved by : [Signature]
(Mr. Noppog Juntarupan)
Enviro Field Coordinator Scientist (3)

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



Jiranatee Associates Co., Ltd.
63/14-15, 63/20-26
Pichitkarn 7/21, 63 Wattana, Bangkok
(Bangkok 10500 Thailand)
Tel: +66(0)8008012
Mobile: +66(0)80000553
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Air speed measurement laboratory
Calibration services department

PREPARED BY : [Signature]
APPROVED BY : [Signature]
EFFECTIVE DATE : 19/4/24

Certificate Number

CL-013-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Navlynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-250L-D
SERIAL NUMBER : Sensor: WS0-014
Data logger: AS789
ID NUMBER : RYG_FS0531
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Jan 2023
MEASUREMENT DATE : 19 Jan 2023
ISSUE DATE : 20 Jan 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

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

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.6)°C, (46.6) %RH and (1014.9) hPa.

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

Calibrated by : ☒ Mr. Soravit Thakulad
☐ Miss Jirapattana Lertsomphol

Approved signatory : [Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
1. Notice cross-section area of the wind tunnel
2. Projected cross-section area of the tested object include mounting pipe
3. Quantity of mounting pipe
4. Basis 1 m²

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

Certificate Number

CL-013-66

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

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

Air speed m/s	D ₁₀₀ Degree (°)	D ₁₀₀ Degree (°)	Error Degree (°)	U (k=2) Degree (°)
4.99	0.000	0	0	0.58
	45.000	43	-2	0.74
	90.000	88	-2	0.74
	135.000	133	-2	0.74
	180.000	179	-1	0.74
	225.000	227	2	0.74
	270.000	272	2	0.74
	315.000	317	2	0.74

Remark:

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

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration

Certificate Number

CL-013-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM MANUFACTURER MODEL/TYPE

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

SERIAL NUMBER

: Sensor: WSD-014

ID NUMBER

: Data logger: A5789

CONDITION AS RECEIVED

: RWS, FS0531

CUSTOMER

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

RECEIVED DATE

: 16 Jan 2023

MEASUREMENT DATE

: 18 Jan 2023

ISSUE DATE

: 20 Jan 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 1.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION

: Effel-type wind tunnel of Jirantee Associates Co., Ltd.

CALIBRATION CONDITIONS

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

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol

Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

¹ Nozzle cross-section area of the wind tunnel.
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Area "a"

Calibration procedure:
The cup anemometer was calibrated against
Standard air velocity transducer model: B4550-2
and pitot tube with precision differential pressure
meter model: DP41550 in an Effel-type wind tunnel of
Effel-type wind tunnel with 900 cm² cross test
section area. The WI-CL-001 based on IEC 61800-
12-1, Wind energy generation systems - Part 12-1:
Power performance measurements of
electricity producing wind turbines, March 2017
was used as a calibration guideline.

Necessity:

This certificate provides a traceability of the
measurement to recognized the national
standards, and to realization of the International
system of units (SI) through the NIMT (National
Metrology Institute of Thailand) via Certificate
number: MW-0552-21 and MW-0066-22

Uncertainty of Measurement:

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

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

Certificate Number

CL-013-66

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V_{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC} (m/s)	Error (m/s)	U (k=2) (m/s)
0.983	23.60	23.70	0.7	-0.3	0.18
2.024	23.74	23.70	1.7	-0.3	0.16
3.044	23.50	23.70	2.9	-0.2	0.18
4.119	23.82	23.70	3.9	-0.2	0.19
5.02	23.50	23.70	4.9	-0.2	0.18
5.99	23.88	23.70	5.8	-0.2	0.18
7.08	23.50	23.70	6.9	-0.1	0.20
8.18	23.58	23.70	8.0	-0.2	0.18
9.11	23.50	23.70	9.0	-0.1	0.19
10.08	23.66	23.70	10.0	-0.1	0.25
11.15	23.32	23.70	11.0	-0.2	0.21
12.14	23.66	23.70	12.0	-0.2	0.20
13.20	23.32	23.70	13.2	0.0	0.25
14.25	23.50	23.70	14.9	-0.1	0.27
15.23	23.30	23.70	15.1	-0.2	0.27
16.29	23.40	23.70	16.2	-0.1	0.23

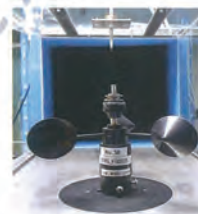
Remark:

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

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the cup anemometer calibration in the wind tunnel of Jirantee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate

CERTIFICATE OF CALIBRATION

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

Equipment Name: Data Logger with Temperature Sensor

Manufacturer: Novalynx
Model: 110-WS-250L-D
Serial No: A5789
ID No.: RYG_FS0531

Customer

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

Received date: 16 Jan 2023

Calibration date: 18 Jan 2023

Issue date: 20 Jan 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No: 671407-00591, Due date: 22 July 2023

Calibration Condition

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

Calibration Procedure

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

Traceability

The measurement results are traceable to the
international system of units (SI) through the National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0034-22, Certificate number: ER-0092-
22

Calibrated by

☒ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol

Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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:

20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP80 S/N: T0210901.

Dimension : Diameter 12 mm. Length 80 mm.

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

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

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

Measurement Item : Relative humidity with data logger
Manufacturer : Novolynx
Model/Type : 110-WS-25DL-D
Serial Number : A5789
ID No. : RY0_F80531
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (25±3)°C, and relative humidity of (50±15)%.

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

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

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

Measurement Result:
This equipment was connected with indoor air quality probe and Displayed (URI) on display. Model: HMP60. Serial number: T0210901.


Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

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

Performed by
☐ Mr. Sorawit Thechalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: 
Mr. Parinya Booncharoen
Calibration Department Manager

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No.: ACC23005
Pages : 1 of 3

Calibration Certificate

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

Condition As Found : GOOD

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

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

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

Calibrated by : Nathakorn Pisuaisan

Approved by : 
(Thanakul Petchurai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACC23005
Job No.: VC66AC0024
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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

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

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACC23005
Job No.: VC66AC0024
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.98	-0.02	0.14	0.40

2. Frequency

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

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
0.35	0.10	3.0

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

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22193
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597167 / 157778 / 34375
ID No.: RYG_FS0437

Condition As Found : GOOD

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

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

Received Date : 06 SEPTEMBER 2022
Calibration Date : 07-09 SEPTEMBER 2022
Date of Issue : 14 SEPTEMBER 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.3

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

Frequency Weighting	Measured value (dB)
A - weight	15.1
C - weight	21.4
Flat	27.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.3	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.6	-0.6	-0.6	± 5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
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	89.1	0.1	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.1	0.1	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

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

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22193
Job No. : VC65AC0081
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Cert. No. : ACL22194
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597168 / 179117 / 87524
ID No.: RYG_FS0438

Condition As Found : GOOD

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

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

Received Date : 06 SEPTEMBER 2022
Calibration Date : 07-09 SEPTEMBER 2022
Date of Issue : 14 SEPTEMBER 2022



Calibrated by : Nathakorn Pisutpaisan

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.7	1.8	1.8	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

T. Reth

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Reth

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

T. Reth

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Reth

CERTIFICATE OF CALIBRATION

ISSUED BY: **Cirrus Research plc**

DATE OF ISSUE: **01 December 2022** CERTIFICATE NUMBER **184072**

Page 1 of 1

Test engineer: **Terry Goodrich**

Electronically signed: *T. A. Goodrich*

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

REVIEW BY: *Monk P*

APPROVED BY: *Hele*

NEXT CAL DATE: *11/12/23*

doseBadge Reader

Instrument

Manufacturer: **Cirrus Research plc**

Model Number: **RC110A**

Serial Number: **73729**

Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: **01 December 2022**

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Result	113.96	998.2	0.64
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

No adjustments were made during this calibration.

Environmental Conditions

Pressure: **102.11 kPa**

Temperature: **23.5 °C**

Humidity: **35.2 %**

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

J NAC

63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Waltham, Bangkokkyl, Bangkok 10600 Thailand.

Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

CL-134-65

Page 1 of 2

CERTIFICATE OF CALIBRATION

Equipment Name: Heat Stress Monitor

Manufacturer: DeltaOHM

Model: HD32.2

Serial No: 15020735

ID No: RYG_FS0231

Customer

Name: ALS laboratory group (thailand) Co.,Ltd.

Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 27 Jul 2022

Calibration date: 3 Aug 2022

Issue date: 8 Aug 2022

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500, Serial No.: 667682-09, Due date: 23 Mar 2023

2. Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 04 June 2022

Calibration Condition

Temperature: (23±3) °C

Relative Humidity: (55±15)%

Calibration Procedure

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

Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0034-22, Certificate number: ER-0032-21.

Calibrated by

☐ Mr. Sorawit Thachalad

☒ Miss Jitraporn Lertsomphol

Approved Signatory: *Jiranatee*

Mr. Parinya Booncharoen
Calibration Department Manager

J NAC

IRANATEE ASSOCIATES CO., LTD.

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Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

CL-134-65

Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: **20 - 40 °C**

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15035050.
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.043	20.1	0.1	0.099
30	25.037	25.1	0.0	0.14
30	30.027	30.0	0.0	0.14
30	35.021	35.0	0.0	0.099
30	40.012	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15033221.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.043	20.1	0.1	0.099
70	25.037	24.9	-0.1	0.099
70	30.028	29.7	-0.3	0.099
70	35.021	34.5	-0.5	0.099
70	40.011	39.5	-0.5	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 17023218.
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.043	20.1	0.1	0.099
110	25.037	25.1	0.1	0.099
110	30.028	30.1	0.1	0.099
110	35.021	35.1	0.1	0.099
110	40.012	40.1	0.1	0.099

UUC* : Unit Under Calibration

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

★ End of Certificate ★

J NAC

IRANATEE ASSOCIATES CO., LTD.

J NAC

63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Waltham, Bangkokkyl, Bangkok 10600 Thailand.

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CL-162-65

Page 1 of 2

CERTIFICATE OF CALIBRATION

Equipment Name: Heat Stress Monitor

Manufacturer: Delta OHM

Model: HD32.2

Serial No: 15030244

ID No: RYG_FS0236

Customer

Name: ALS laboratory group (thailand) Co.,Ltd.

Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 15 Nov 2022

Calibration date: 21 Nov 2022

Issue date: 23 Nov 2022

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500, Serial No.: 667682-09, Due date: 23 Mar 2023

2. Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

Temperature: (23±3) °C

Relative Humidity: (55±15)%

Calibration Procedure

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

Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0034-22, Certificate number: ER-0092-22

Calibrated by

☒ Mr. Sorawit Thachalad

☐ Miss Jitraporn Lertsomphol

Approved Signatory: *Jiranatee*

Mr. Parinya Booncharoen
Calibration Department Manager

J NAC

IRANATEE ASSOCIATES CO., LTD.

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Certificate No.: CL-162-65
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 20030506.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.062	20.1	0.0	0.099
30	25.050	25.1	0.1	0.099
30	30.044	30.1	0.1	0.099
30	35.035	35.1	0.1	0.099
30	40.031	40.1	0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15033223.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.064	20.1	0.0	0.099
70	25.049	24.9	-0.1	0.099
70	30.042	29.7	-0.3	0.099
70	35.035	34.5	-0.5	0.099
70	40.032	39.4	-0.6	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 17009684.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.064	20.0	-0.1	0.099
110	25.050	25.0	-0.1	0.099
110	30.042	30.0	0.0	0.099
110	35.034	35.0	0.0	0.099
110	40.031	40.0	0.0	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2716-9864



Cert.No.: 23CH275
Page: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183
Condition As-Received: Used Item
Received Date: 24 February 2023
Calibration Date: 27 February 2023
Reference: 2302-0886DSC-2
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

REVIEW BY N. Banit
APPROVED BY D. K.
NEXT CAL. DATE 27/2/24

Calibrated by: Walailak Sinithean

Approved by: Sathip
Approved Signatory

() Malee Butkruea
(✓) Sathip Meangmai
() Warakorn Lemgatrakul

Issue Date: 28 February 2023
The Uncertainties are for a confidence probability of approximately 95%.

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A 0051538



Cert.No.: 23CH275
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	2211306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function: mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: C104059460	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00



Cert.No.: 23CH275
Page: 3 of 3

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: 1453404	4.008	4.008	179.1	0.0046	2.00
	6.987	6.988	4.7	0.0084	2.00
	10.010	10.013	-172.4	0.0069	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: InLabExpert Pro-ISM
- Serial No.: 1453404

Dimension of probe;

- Length: 120 mm.

- Diameter: 12 mm.

- Immersion Depth: 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	24.8	-0.201	0.13	2.00

Remark: - UUC* = Unit Under Calibration

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

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a 1149925

a 1149924



Certificate of Calibration

Certificate No.: 23E753
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183
Condition As-Received: Used Item
Received Date: 24 February 2023
Calibration Date: 28 February 2023
Reference: 2302-0896DSC
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Procedure used: Calibration were conducted using In-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	22E1670	18 May 2023

2.This result of calibration was made on requested at the point specified by customer.
3.The certificate is valid only to the item calibrated on date and place of calibration.
4.This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Wulcharaporn Wongchulakrime
Issue Date: 02 March 2023
Approved Signatory: [Signature]
[] Phalinee Prabpaipai
[x] Nuntawat Khamchai
[] Pornthippa Tameyakul

B 0309672

Cert. No.: 23E753
Page: 2 of 2

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

Function:	DC voltage measurement	Range:	2000	mV
	Standard Value	UUC* Reading	Error	Uncertainty
	(mV)	(mV)	(mV)	(± μV)
	-200.0000	-200.0	0.0	72
	-150.0000	-150.0	0.0	69
	-100.0000	-100.0	0.0	65
	-50.0000	-50.0	0.0	62
	0.0000	0.0	0.0	58
	50.0000	50.0	0.0	62
	100.0000	99.9	-0.1	65
	150.0000	149.9	-0.1	69
	200.0000	199.9	-0.1	72

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

UUC* = Unit Under Calibration.

-000-

a 1150477



Cert.No.: 22TW34
Page: 1 of 2

Certificate of Testing

Equipment: DO Meter
Manufacturer: YSI
Model: 5000-115V
Serial No.: 15E102796
ID No.: RYG_EN0032
Received Date: 11 February 2022
Test Date: 14 February 2022
Reference: 2202-0404DSC-4
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand
Laboratory Condition: Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure: In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by: Walalak Sirinthean
Approved by: [Signature]
Approved Signatory
() Malee Butkruea
(x) Saitthip Meangmai
() Warakorn Lemagtrakul
Issue Date: 18 February 2022

REVIEW BY N. Bannat
APPROVED BY D. [Signature]
NEXT CAL. DATE 15/8/23

B 0281285



Cert.No.: 22TW34
Page: 2 of 2

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

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0084

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

-000-

Saitthip

a 1094744



Cert. No.: 22LM12
Page: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,
Rayong 21140, Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 11 February 2022
Calibrated Date : 21 February 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promrat
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 21 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0038008



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2202-0404DSC-5
Procedure Used :-

Cert. No.: 22LM12
Page: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188080	2111273	22 Nov 2022
2. This certificate is valid only to the item calibrated on date and place of calibration.				
3. This certification is traceable to the International System of Unit.				

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	45	20.001	19.88	-0.121	0.15	2.00

UUC* : Unit Under Calibration

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

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a 1095714



Cert. No.: 22TM317
Page: 1 of 3

Certificate of Calibration

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng, Rayong 21140, Thailand
BOD Room
Location :
Received Order : 22 April 2022
Calibration Date : 22 April 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpalboon
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

REVIEW BY
APPROVED BY
NEXT CAL. DATE 23/10/23

Issue Date : 3 May 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0040735



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Procedure Used :-

Cert. No.: 22TM317
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

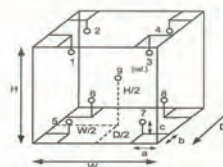
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44031769	21LM12	02 Sep 2022
2. This certificate is valid only to the item calibrated on date and place of calibration.				
3. This certification is traceable to the International System of Unit.				

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply (Volt)	221	223



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	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

a 1106485



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-2

Cert. No.: 22TM1517
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY49023932	22LM97	29 Jul 2023

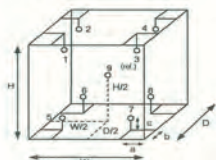
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	59
AC Supply (Volt)	223	225

Ref. Std. ID No.: @ Calibration Point		
Position :	(180) °C	(104) °C
1	21-16TC-01	20-16RTD-01
2	21-16TC-02	20-16RTD-02
3	21-16TC-03	20-16RTD-03
4	21-16TC-04	20-16RTD-04
5	21-16TC-05	22-16RTD-05
6	21-16TC-06	20-16RTD-06
7	21-16TC-07	20-16RTD-07
8	21-16TC-08	22-16RTD-08
9 (ref.)	21-16TC-09	22-16RTD-09

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

a 1132466



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-2

Cert. No.: 22TM1517
Page : 3 of 3

Result of Calibration :-

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.076	0.52	0.60	0.42	2
180.0	180.0	180.0	0.13	0.88	1.2	1.1	2

Measured Temperature (°C)									
Calibration Point (°C)	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.768	103.734	103.723	103.800	104.215	104.131	104.132	103.740	103.747
180.0	179.723	179.359	179.439	179.489	180.361	180.114	180.131	180.243	179.605

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor

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

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation UUC* : Unit Under Calibration

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

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

-000-

a 1132465

RYG_EN0006



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD 509 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2716-9484



Cert. No.: 22TM1492
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UM 400

Serial No. : b495.0699

ID No. : RYG_EN0006

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

Location : Oven Room

Received Order : 20 October 2022
Calibration Date : 20 October 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hiahb

Approved by :
Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0046905



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-1

Cert. No.: 22TM1492
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

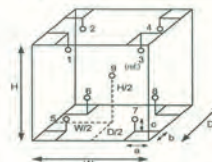
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close




Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	43	47
AC Supply (Volt)	220	221

Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.33 m
b = 5.0 cm W = 0.40 m
c = 5.0 cm H = 0.40 m
Capacity = 0.053 m³

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

a 1132473



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2210-03760C-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM1492
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
70.0	70.0	70.0	0.079	0.47	0.77	0.42	2


Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	70.262	69.995	70.079	70.177	70.664	70.039	70.688	70.149	70.328



Average* : The average of 30 values in each position.
 Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor
 Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
 Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation
 UUC* : Unit Under Calibration
 Note : The reported uncertainty of measurement was included stability and excluded uniformity .
 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-000-

Melu.

a 1132472

 TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL: 0-2717-3000-27 FAX: 0-2719-9484


Cert. No.: 22TM1491
 Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
 Manufacturer : Memmert
 Model : WNB22
 Serial No. : L513.0648
 ID No. : RYG_EN0061
 Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
 616/10 Moo 5, T. Maenam Khu,
 A. Pluakdaeng,
 Rayong 21140, Thailand
 Location : Wet Chemistry Lab
 Received Order : 20 October 2022
 Calibration Date : 20 October 2022
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Preecha Hiahib
 Approved by : *Melu.*
 () Pornthippa Tameyakul
 (/) Malee Butkruea
 () Suwit Imjai
 Issue Date : 2 November 2022

The Uncertainties are for a confidence probability of approximately 95 %
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A 0046906



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2210-03760C-4
 Procedure Used :-

Cert. No.: 22TM1491
 Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).
 The temperature scale used was based on ITS-90.
Condition of this result of calibration
 1. Reference standard instrument:-
 Instrument Model Serial No. Cert. No. Due Date
 1) Data Acquisition 34970A MY44035217 21LM30 23 Dec 2022
 2. This certificate is valid only to the item calibrated on date and place of calibration.
 3. This certification is traceable to the International System of Unit.
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source


	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	53	222
Finished of Calibration	24	50	221

Position :	Ref. Std. S/N.:
1	N37P300726
2	N37P300727
3	N37P300728
4	N37P300729
5(ref.)	N37P300730

Front

Melu.

a 1132471



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2210-03760C-4
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 22TM1491
 Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.527	84.563	84.628	84.516	84.580

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
85.0	0.12	0.081	0.18	2

Average* : The average of 30 values in each position.
 Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
 Stability : One-half of the greatest maximum difference of measured temperature at any one probe.
 UUC* : Unit Under Calibration
 Note : The reported uncertainty of measurement was included stability and excluded uniformity .
 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Melu.

a 1132470



Cert.No.: 23CH134
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go
Serial No. : B627713284
ID No. : RYG_FS0391
Condition As-Received: Used Item
Received Date : 31 January 2023
Calibration Date : 01 February 2023
Reference : 2301-1028DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

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

Calibrated by : Walalak Sirithean

Approved by :
Approved Signatory

(/) Malee Bulkruea
() Sathip Meangmai
() Warakorn Lernagatrakul

Issue Date : 3 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0050476



Cert.No.: 23CH134
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	221306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.008	CPA chem	826590	09 July 2023

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: B627713284	4.00	177.48	178	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

a 1146683



Cert.No.: 23CH134
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: 2337383	4.008	4.01	189	0.0085	2.05
	6.987	6.99	18	0.011	2.00
	10.008	10.01	-160	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Go-ISM

- Serial No. : 2337383

Dimension of probe;

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 110 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
40.0	40.003	40.2	0.197	0.13	2.00

Remark : UUC* = Unit Under Calibration

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

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a 1146682

Metrological Center

SCI ECO Services Company Limited

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

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 +669 8247 2380

Website : www.scieco.co.th E-Mail : calibr@scieco.com



Certificate No. T230116

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)
Manufacturer : MODULAR
Model : IREVCOHCOQ
Serial No. : C00351459
Customer Code : RYG_EN0184
ID No. : T1939A5
Customer : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140
Customer Location : Laboratory
Date of Receipt : 23 January 2023
Calibrated By : Atiphong Rongrat (Technician)
Approved By :
Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 07 FEB 2023



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

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

PM-L1010831-08-04

Certificate No. T230116

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
 Date of Calibration : 25 January 2023
 Environment : Temperature : 23.4-24.9 °C
 Line Voltage : 221.4-230.2 V
 Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).
 All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T222123	5 October 2023
TC	TYPE T	TN151-TN160	T222123	5 October 2023
DATA LOGGER	34970A	T150	T222123	5 October 2023

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 1 Hour - Minute At 3 °C
 Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

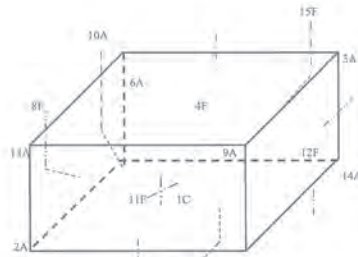
Approved By.

PAGE 11 (17/10/03) (P)

Certificate No. T230116

Page 3 of 4

Calibration Report



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

1C = TN141	12F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15F = TN155
5A = TN145	16E = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By.

PAGE 11 (17/10/03) (P)

Certificate No. T230116

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150	TN151	TN152
3.0	3.03	3.16	3.15	3.19	3.45	3.47	3.21	3.35	3.34	3.45	3.24	3.34
	TN153	TN154	TN155	TN156								
	3.28	3.22	3.26	3.21								

Chamber (Cooling Room)			Temperature Distribution			
Setting (°C)	Reading (°C)		Stability (°C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min, Max	Average				
3.0	2.8, 4.1	3.5	1.20	1.20	1.90	2.07

The calibration result apply only the above calibrated item.

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

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

Approved By.

PAGE 11 (17/10/03) (P)

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REVIEW BY
 APPROVED BY
 NEXT CAL DATE 21/12/23

Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-00 + GCMS-00

System ID: GM-7
 Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
 Organization Location: 104 Pathanakarn rd., Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: June 21, 2022 2:04:12 PM
 EQP Name: AgilentRecommended, AgilentRecommended
 EQP Revision: GC.02.50, GCMS.02.50
 Overall Qualification Status: Pass

System inspection and Basic Safety and Operation

Name: 7890
 Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
 Front SSL
 Setpoint Status: Pass
 Setpoint: 25.0 psi
 Actual: 25.0 psi
 Inlet Pressure: 25.0 psi
 Accuracy: 0.0 psi
 Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: June 21, 2022 2:04:12 PM
 System ID: GM-7

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Setpoint Status: **Pass**

Zone: **Oven**

Setpoint/Actual

Temperature: 230.0 230.0 °C

Accuracy: 0.0 °C

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

Setpoint Status: **Pass**

Zone: **Oven**

Setpoint/Actual

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

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

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: **Pass**

Setpoint/Average

Temperature: 100.0 100.0333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977A

Setpoint Status: **Pass**

Date: June 21, 2022 2:04:12 PM
System ID: GM-7

Page 2 / 15

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977A

Setpoint Status: **Pass**

Amu: 1050 m/z Drift After Five Minutes: 22 mV RPA Voltage: 568 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977A

Setpoint Status: **Pass**

Filament: 1

Setpoint Status: **Pass**

Filament: 2

Overall Tune EI Test Status

Pass

Signal to Noise EI

Tested Combination1 Front SSL / External SQ

Name: 5977A

Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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Source: EI - Extractor Filament: 1

Setpoint Status: **Pass**

Signal to Noise: 51283

Agilent Recommended: >= 1200

Source: EI - Extractor Filament: 2

Setpoint Status: **Pass**

Signal to Noise: 7058

Agilent Recommended: >= 1200

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

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration

Details

System	
System ID	GM-7
Manufacturer	Agilent Technologies
Name	7890
Testset Combination1	
Injection Technique	Manual Injection
Inlet	Front
Detector	External
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10
Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN14133181
Firmware Revision	B.02.03
Oven Type	Standard

Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977A
Serial Number	US1415M209
Firmware Revision	5977 6.00.21
High Vacuum System	Turbo Pump
Scouting Run Standard	DFN Std

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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Electronic Signature

Purpose

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

Details

Full Name of Signer:	Supasak Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	June 21, 2022
Reason for Signature:	Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Username: SCG11596C

System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-OM7-2022 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 10:35:05 AM	Audit	Session Created	Session	None
June 21, 2022 10:25:05 AM	Start	Configuration	Session	None
June 21, 2022 10:21:05 AM	Audit	Enrollment	Licensing	User is FirstSigner and does not require an unlock code.
June 21, 2022 10:20:26 AM	Audit	ExpLoseSet	Session	ECP exists for primary technique [SIC] - File path: (ProcessRecord)\Config\anal\rom02_0000-02_30.exp, ECP File Name: (SQ-02.30.exp), ECP Name: (AgilentRecommended) ECP exists for hybridized technique [SIC] - File path: (ProcessRecord)\Config\unlocked\02_3000-02_50.exp, ECP File Name: (SQ-02.50.exp), ECP Name: (AgilentRecommended)
June 21, 2022 10:20:36 AM	End	Configuration	Session	None
June 21, 2022 10:20:43 AM	Start	Qualification	Session	OQ
June 21, 2022 10:20:43 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No subpoints associated	None
June 21, 2022 10:20:54 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No subpoints associated	Run Count: 1

Page 1 / 8

Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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User Name: supasak.nimsongtham
Username: SCG11596C

System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-OM7-2022 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 10:36:50 AM	Start	Execution	Inlet Pressure Accuracy - Front SSU - Pressure Controlled Test - 0.25.0 psi - L <= +1.2 psi	None
June 21, 2022 10:25:10 AM	End	Execution	Inlet Pressure Accuracy - Front SSU - Pressure Controlled Test - 0.25.0 psi - L <= +1.2 psi	Run Count: 1
June 21, 2022 10:36:12 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.230.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	None
June 21, 2022 10:36:09 AM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.230.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	Manual Data Entry
June 21, 2022 10:34:10 AM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.230.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	Run Count: 1
June 21, 2022 10:34:11 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.180.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	None
June 21, 2022 10:33:42 AM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.180.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	Manual Data Entry
June 21, 2022 10:33:44 AM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - 0.100.0°C - L <= +1.0 AND <= +1.0 % setpoint in K	Run Count: 1
June 21, 2022 10:33:46 AM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - 0.180.0°C - L <= +0.5°C	None

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Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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User Name: kysupak.kim@agilent.com
Machine: SC011159KC
System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-GM7-2022 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 11:01:09 AM	Auto	AcqClosed	Session	None
June 21, 2022 11:01:47 AM	Auto	AcqRestarted	Session	None
June 21, 2022 11:01:48 AM	Auto	SessionReleased	Session	None
June 21, 2022 11:01:51 AM	Start	Qualification	Session	OK
June 21, 2022 11:01:51 AM	Start	Execution	QC Oven Temperature Stability - 750°C - Temperature: Oven - IS: 100.0°C - L: n= 0.0°C	None
June 21, 2022 11:03:14 AM	Auto	Data	DataManager	DataManager was in a data verification state but the user chose to start over.
June 21, 2022 11:04:19 AM	Auto	Data	QC Oven Temperature Stability - 750°C - Temperature: Oven - IS: 100.0°C - L: n= 0.0°C	Manual Data Entry
June 21, 2022 11:04:22 AM	End	Execution	QC Oven Temperature Stability - 750°C - Temperature: Oven - IS: 100.0°C - L: n= 0.0°C	Run Count: 1
June 21, 2022 11:04:24 AM	Start	Execution	Liq Amp - 5077A SQ - Source: None EI - Extractor	None
June 21, 2022 11:05:34 AM	End	Execution	Liq Amp - 5077A SQ - Source: EI (none) EI - Extractor	Run Count: 1
June 21, 2022 11:04:37 AM	Start	Execution	RIPA - 5077A SQ - Source: EI (none) EI - Extractor	None
June 21, 2022 11:07:49 AM	End	Execution	RIPA - 5077A SQ - Source: EI (none) EI - Extractor	Run Count: 1
June 21, 2022 11:07:52 AM	Start	Execution	Temp EI - 5077A SQ - Source: None EI - Extractor Flamed 1 (Qualitative - No supports assesssed)	None

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User Name: kysupak.kim@agilent.com
Machine: SC011159KC
System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-GM7-2022 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 11:08:35 AM	End	Execution	Temp EI - 5077A SQ - Source: None EI - Extractor Flamed 1 (Qualitative - No supports assesssed)	Run Count: 1
June 21, 2022 11:14:59 AM	Start	Execution	Temp EI - 5077A SQ - Source: None EI - Extractor Flamed 2 (Qualitative - No supports assesssed)	None
June 21, 2022 11:16:48 AM	End	Execution	Temp EI - 5077A SQ - Source: None EI - Extractor Flamed 2 (Qualitative - No supports assesssed)	Run Count: 1
June 21, 2022 11:18:43 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	None
June 21, 2022 11:17:55 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	None
June 21, 2022 11:17:19 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	None
June 21, 2022 11:20:09 AM	Auto	AcqClosed	Session	None
June 21, 2022 12:36:20 PM	Auto	AcqRestarted	Session	None
June 21, 2022 12:36:22 PM	Auto	SessionReleased	Session	None
June 21, 2022 12:36:35 PM	Start	Qualification	Session	OK
June 21, 2022 12:36:29 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	None

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System ID: GM-7

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Date: June 21, 2022 2:04:12 PM
System ID: GM-7

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User Name: kysupak.kim@agilent.com
Machine: SC011159KC
System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-GM7-2022 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 12:37:57 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	None
June 21, 2022 12:39:09 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	None
June 21, 2022 12:36:54 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF1_001.D
June 21, 2022 12:39:26 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF1_001.D
June 21, 2022 12:40:05 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF1_001.D
June 21, 2022 12:42:04 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF1_001.D
June 21, 2022 12:42:17 PM	Auto	AcqClosed	Session	None
June 21, 2022 12:33:21 PM	Auto	AcqRestarted	Session	None
June 21, 2022 12:33:35 PM	Auto	SessionReleased	Session	None
June 21, 2022 12:33:37 PM	Start	Qualification	Session	OK
June 21, 2022 12:33:37 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	None

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User Name: kysupak.kim@agilent.com
Machine: SC011159KC
System ID: GM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-GM7-2022 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 12:34:14 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 1 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF1_001.D
June 21, 2022 12:39:26 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Run Count: 1
June 21, 2022 12:37:11 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	None
June 21, 2022 12:38:15 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF2_001.D
June 21, 2022 12:38:30 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF2_001.D
June 21, 2022 12:38:45 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF2_001.D
June 21, 2022 12:39:26 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF2_001.D
June 21, 2022 12:36:14 PM	Auto	Data	Signal to Noise EI - Liquid Injection, Front SSI, SQ - Source: EI - Extractor using Flamed 2 - L: n= 1200	Data File Path: E:\ALSGM7_2022\GMF2_001.D

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System ID: GM-7

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System ID: GM-7

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User Name: support@crosslab.com
Hardware: SCC111546C

System ID: DM-2
Print Date: June 21, 2022 2:04:17 PM

ALS-QM7-2022 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 12:39:45 PM Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Data File Path: E:\ALSCM7_2022\DMF2_001.D	
June 21, 2022 12:42:15 PM Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Data File Path: E:\ALSCM7_2022\DMF2_001.D	
June 21, 2022 12:42:40 PM Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Data File Path: E:\ALSCM7_2022\DMF2_001.D	
June 21, 2022 12:45:05 PM Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Data File Path: E:\ALSCM7_2022\DMF2_001.D	
June 21, 2022 12:41:29 PM End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Run Count: 1	
June 21, 2022 12:42:30 PM Audit	Transaction	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Deviation Smaller than Count: 1.1	
June 21, 2022 12:42:30 PM Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	None	
June 21, 2022 12:42:35 PM Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Data File Path: E:\ALSCM7_2022\DMF2_001.D	

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Date: June 21, 2022 2:04:12 PM
System ID: DM-7

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User Name: support@crosslab.com
Hardware: SCC111546C

System ID: DM-7
Print Date: June 21, 2022 2:04:17 PM

ALS-QM7-2022 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 21, 2022 12:42:45 PM End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 2 - L: 1000	Run Count: 2	
June 21, 2022 12:42:00 PM End	Qualification	Session	Session	DQ
June 21, 2022 12:42:50 PM Start	Reporting	Session	Session	None
June 21, 2022 12:45:17 PM Audit	Acquisition	Session	Session	None
June 21, 2022 1:57:47 PM Audit	Acquisition	Session	Session	None
June 21, 2022 1:57:50 PM Audit	Session/Reported	Session	Session	None
June 21, 2022 1:57:56 PM Start	Qualification	Session	Session	DQ
June 21, 2022 2:02:42 PM Audit	Reporting	Session	Session	Report Generated: Certificate

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Date: June 21, 2022 2:04:12 PM
System ID: DM-7

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ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน

เรื่อง คัดอาชญาหนึ่งสืบทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอรับผลการทดสอบห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผน
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผน
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๓ แผน


ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๑๔-๙-๑๐๑๔ สถานที่ตั้งเลขที่ ๓๐๕
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด คัดอาชญาหนึ่งสืบทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำเสีย
จำนวน ๑๖๒ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๖ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้แจ้งหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันทรเจิด)
อธิบดีกรมโรงงานอุตสาหกรรม
ผู้อำนวยการกองบริหารและส่งเสริมโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนากลพิษโรงงาน


กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๔๔๖ - ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๒๕๔ ๓๒๐๘ - ๐ ๒๒๕๔ ๓๖๐๔

๓. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

- | | |
|--------------------------------|-----------------------------|
| ๑) นางสาวยุพพร จันทน์ปลั่ง | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๐ |
| ๒) นางสาวจันทน์ โกมารกุล ณ นคร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๑ |
| ๓) นายศราวุธ จิตรานนท์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๒ |
| ๔) นางสาวกนกพร เอนก | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๓ |
| ๕) นายสุริยา สอนแก้ว | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๔ |
| ๖) นายวิฑูรย์ ชุมพร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๕ |


(นายศิระ จันทรเจิด)
อธิบดีกรมโรงงานอุตสาหกรรม
ผู้อำนวยการกองบริหารและส่งเสริมโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๔. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

- | | |
|--|-----------------------------|
| ๑) นางสาวจินดา โขกุลธรรม | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๑ |
| ๒) นางสาวสิริวิทย์ น้อยเสถียร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๒ |
| ๓) นางสาวชัญญ์ชญาญ์ ชัยชนะ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๓ |
| ๔) นางสาววันวิมล สันติสุข | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๔ |
| ๕) นางสาวนันทิณี สมบูรณ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๕ |
| ๖) นางสาวศรีมาลา เถลิงศรีวงศ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๖ |
| ๗) นางสาวสิริวิมล มงคลจิตรวิมล | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๗ |
| ๘) นางสาวศิริลักษณ์ พึ่งแพ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๘ |
| ๙) นายอนุพงษ์ จันทน์พิทักษ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๑๙ |
| ๑๐) นายอนุสรณ์ โกมลย์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๐ |
| ๑๑) นายธินา อธิยา | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๑ |
| ๑๒) นางสาวเกศรินทร์ แก้วมณี | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๒ |
| ๑๓) นางสาวสุวิมล ชัยเจริญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๓ |
| ๑๔) นางสาวสุชาดา ธรรมถาวร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๔ |
| ๑๕) นางสาวเป็กกา อธิชนนกุล | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๕ |
| ๑๖) นางสาวศศิธร พูลสวัสดิ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๖ |
| ๑๗) นางสาวเสาวลักษณ์ ภูพานาทรัพย์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๗ |
| ๑๘) นายอภิสิทธิ์ สิงหา | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๘ |
| ๑๙) นายศักดิ์สิทธิ์ โพธิ์คำพิทักษ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๒๙ |
| ๒๐) ว่าที่ร้อยตรีหญิง พรรณีภา จำเริญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๐ |
| ๒๑) นางจิตตา คำแก้ว | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๑ |
| ๒๒) นางสาวอรรณพ รักษ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๒ |
| ๒๓) นางสาวพนรัตน์ แยมกรานต์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๓ |
| ๒๔) นายจุลเชษฐ์ วารินทร์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๔ |
| ๒๕) นางสาวกาญจนา รุ่งคำ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๕ |
| ๒๖) นายสมร สุขเจริญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๖ |
| ๒๗) นายปัญญา นามะเดช | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๗ |
| ๒๘) นายพนม ศรีปิ่นนคร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๘ |
| ๒๙) นายสุทิน อุ่นมณี | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๓๙ |
| ๓๐) ว่าที่ร้อยตรี เจริญเกียรติ อมาศรีเสริม | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๐ |
| ๓๑) นางสาววิภา สว่างนา | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๑ |
| ๓๒) นายอนุพงษ์ รัตนศรีประเสริฐ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๒ |
| ๓๓) นางสาวจุฬารัตน์ โอนสินธุ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๓ |
| ๓๔) นางสาวจรรยาพร พินธุสุตติยา | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๔ |

(นายศิระ จันทรเจิด)

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ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๓๕) นางสาวปรางค์ทิพย์...

- | | |
|--------------------------------------|-----------------------------|
| ๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๕ |
| ๓๖) นางสาวเดือนใจ พากุล | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๖ |
| ๓๗) นางสาวจิราพร ศิริเว | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๗ |
| ๓๘) นายวรวิทย์ สุทธิรักษ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๘ |
| ๓๙) นายพนม วิริยะสหกิจ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๔๙ |
| ๔๐) นายธนิส เจนจบ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๐ |
| ๔๑) นายศนิศร จำเริญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๑ |
| ๔๒) นายอรรถพล บิณฑิยาพันธ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๒ |
| ๔๓) นายสุวิทย์ พรมเสถียร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๓ |
| ๔๔) นายสมเดช โกวิทพันธ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๔ |
| ๔๕) นายชวฤทธิ์ วงษ์จันทร์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๕ |
| ๔๖) นายอาทิตย์ ศรีเสน | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๖ |
| ๔๗) นายเจตนาถ ศรีกิติโย | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๗ |
| ๔๘) นายจิรุต บุญธิ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๘ |
| ๔๙) นายสมศักดิ์ เอนก | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๕๙ |
| ๕๐) นายอภิวัฒน์ ภูพาน | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๐ |
| ๕๑) นางสาวสุภาวัญญา มาก | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๑ |
| ๕๒) นางสาวทิพย์พร ขวาลสมบุญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๒ |
| ๕๓) นางสาวธิติมา บุญเพ็ญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๓ |
| ๕๔) นางสาวกนกกร เข็มเพชร | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๔ |
| ๕๕) นางสาวพัชรีญา พงษ์มณี | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๕ |
| ๕๖) นางสาวกานดา สุวรรณศรี | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๖ |
| ๕๗) นางสาวกานดา นามวัฒน์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๗ |
| ๕๘) นางสาวสุวิมล พึ่งสุราษฎร์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๘ |
| ๕๙) นายธีรวัฒน์ ปวงสุข | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๖๙ |
| ๖๐) นายอิทธิพล ยะโส | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๐ |
| ๖๑) นายประพนธ์ วรรณสุข | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๑ |
| ๖๒) นายชรัส พงษ์ทิพย์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๒ |
| ๖๓) นางสาวกนกวรรณ อันทาบ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๓ |
| ๖๔) นางสาวนันท ฤทธิบุญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๔ |
| ๖๕) นายสิทธิโชค ธงเงิน | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๕ |
| ๖๖) นายศศิธรวรรณ บุญ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๖ |
| ๖๗) นางสาวพรณิศา พันธ์ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๗ |
| ๖๘) นางสาวศรณีย์ ยี่ง | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๘ |
| ๖๙) นายภาณุกร ศรีวิริยะ | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๗๙ |
| ๗๐) นายสุวิทย์ ทองอ่อน | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๘๐ |
| ๗๑) นายวิญญู บุญน้อย | ทะเบียนเลขที่ ๖-๒๐๑๔-๙-๑๐๘๑ |

(นายศิระ จันทรเจิด)

อธิบดีกรมโรงงานอุตสาหกรรม
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๗๒) นายสมบุญ...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽⁴⁾ 2) Iodometric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
37	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾

44 Methomyl...

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

น้ำดื่ม จำนวน 126 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

3 Aldrin...

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

18 Bis(2-ethylhexyl)phthalate...


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ลำดับที่	สารเคมี	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl Benzyl Phthalate	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

34 Chromium (III)...


วิมล
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และควบคุมโรคพิษ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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51 cis-1,2-Dichloroethylene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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
68 Fluorene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾


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84 Methanol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾ 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


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97 Pentachlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₈ -C ₁₀)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(13,24)
110	TPH (C ₁₀ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^(8,21)
111	TPH (C ₁₅ -C ₂₅)	Solvent Extraction, Gas Chromatographic Method ^(8,21)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิทย์กุล

114 1,1,2-Trichloroethane...

(นางสาวกัญจน์ อัครสกุลวิไล)
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ลำดับที่	สารเคมี	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁸⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁸⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

ตารางรายชื่อ (ปล่องระบาย) จำนวน 16 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾

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3 Carbon Monoxide...

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ลำดับที่	สารเคมี	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ⁽³⁾ 2) Non-Dispersive Infrared Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
4	Chlorine	1) Absorption Sampling, Ion Chromatographic, Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ⁽⁵⁾
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ⁽⁵⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
11	Opacity	Ringelmann's Method ⁽⁴⁾
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽⁵⁾ 2) Chemiluminescence Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) UV Fluorescence Method ⁽⁵⁾ 3) Instrumental Analyzer Method ⁽⁵⁾
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽³⁾
16	Xylene	Absorption Sampling, Gas Chromatographic Method ⁽⁵⁾

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สิ่งปนเปื้อน...

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สิ่งปนเปื้อนหรือวัตถุที่ไม่ใช่แก๊ส จำนวน 35 รายการ


ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,3,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)

วิทย์กุล

6 Cadmium...


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ลำดับที่	สารเคมี	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.15,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.16,17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.15,17) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.16,17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1.6.17) 2) Alkaline Digestion, Colorimetric Method ^(8.17)


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
11 Cobalt....

ลำดับที่	สารเคมี	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25)


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
2) Soxhlet....

ลำดับที่	สารเคมี	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6.18)


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 กรมควบคุมมลพิษ

2) Waste Extraction...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6.19) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.9) 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(2.0)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)


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 กรมควบคุมมลพิษ


27 Polychlorinated...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)


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28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
29	pH	Electrometric Method ^(29,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,14)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13)


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4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,14) 3) Digestion, Inductively Coupled Plasma Method ^(7,13) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)

เพิ่ม จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,20)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)


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
9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,20)
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
15	Benzofluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,20)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,20)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(14,20)
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,20)


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
26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,15,17) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,15,17)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,17)
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(26,28)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)


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
40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22)
41	DDT	2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31) 1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22)
42	Dibenz(a,h)anthracene	2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)


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
57 Dieldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)


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71 Hexachlorobenzene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
74	α-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(16,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾


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2) Thermal...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽¹⁾⁽⁹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾ Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ⁽¹²⁾⁽²¹⁾
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²²⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹³⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁶⁾
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²³⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²³⁾

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- Aroclor 1242...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
	- Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2,3,4,5-Pentachlorobiphenyl - 2,2,4,5,5-Pentachlorobiphenyl - 2,3,3',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',5,5',6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾

(นางริกาญจน์ อัครสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์สิ่งแวดล้อมพิษ
ศูนย์มาตรฐานวิธีการวิเคราะห์สิ่งแวดล้อมพิษ

101 Selenium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹³⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁶⁾
102	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹³⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁶⁾
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ⁽¹⁾⁽²²⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
108	TPH (C ₉ -C ₁₀)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
109	TPH (C ₁₀ -C ₁₅)	1) Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²¹⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽²³⁾⁽³¹⁾
110	TPH (C ₁₆ -C ₂₀)	1) Solvent Extraction, Gas Chromatographic Method ⁽¹⁾⁽²¹⁾ 2) Automated Soxhlet Extraction, Gas Chromatographic Method ⁽²³⁾⁽³¹⁾
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾

(นางริกาญจน์ อัครสกุลวิไล)
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116 2,4,6-Trichlorophenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²³⁾⁽³¹⁾
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹³⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁶⁾
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁴⁾
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁷⁾⁽¹³⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁷⁾⁽¹⁶⁾

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กรมโรงงานอุตสาหกรรม

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กรมโรงงานอุตสาหกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลของห้องปฏิบัติการ การสืบและสืบค้นข้อมูลโครงการ กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๖๒๑ ๔๐๐๑, ๔๐๑๖



ที่ ธก ๐๓๓๐(๑)/ ๕๕๗ ๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐ ๙ มิถุนายน ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๔ กุมภาพันธ์ ๒๕๖๖

ตามที่หนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔/๑๐๖๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ออกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๙ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นายนคร สุขเจริญ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๒ |
| ๒) นายปัญชา นามเขตต์ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๓ |
| ๓) นายอรรถพล นิยมวิทยาพันธ์ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๔ |
| ๔) นางสาวพัชรียา หงษ์สมดี | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๕ |
| ๕) นางสาวภาณุตา สุวรรณศิริกุล | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๖ |
| ๖) นางสาวศรวิทย์ อังศิริ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๗ |
| ๗) นายสมโภช วันสา | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๘ |
| ๘) นายณัฐนันท์ ปานประเสริฐ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๒๙ |
| ๙) ว่าที่ร้อยตรีอนุพงศ์ แสนศรี | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๐ |
| ๑๐) นายณัฏฐ์ พูลศิริ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๑ |
| ๑๑) นายณัฐดนัย เชื้อละออง | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๒ |
| ๑๒) นางสาวกาญจนา คงสุณ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๓ |
| ๑๓) นางสาวรัชมิกร นิยมกลาง | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๔ |
| ๑๔) นางสาวกัญญารัตน์ ศรีนิลพา | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๕ |
| ๑๕) นายศิริวัฒน์ พานิชย์ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๖ |
| ๑๖) นางสาวณภรณ์ อูระ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๗ |
| ๑๗) นางสาวจิตสุภา ประเทืองสุข | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๘ |
| ๑๘) นางสาวอริสา วิริยะสินธรรม | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๓๙ |
| ๑๙) นางสาวพนิดา ยอดอินทร์ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๖๑๔๐ |

๒. ให้เพิ่มเจ้าหน้าที่...

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นายเกษมสันติ กิตติศุภานิชย์ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๑ |
| ๒) นายภัทรพล สว่างใจธรรม | ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๒ |
| ๓) นายบวรวิทย์ เทือกชัยคำ | ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๓ |
| ๔) นายศิริโชค พงษ์ประสม | ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๔ |
| ๕) นายณัฐภูมิ คิ้วแดง | ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๕ |

อนึ่ง หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ออกให้ใช้บังคับและเปลี่ยนแปลงของห้องปฏิบัติการวิเคราะห์เอกชน ที่ ธก ๐๓๓๐(๑)/๑๐๖๔ ลงวันที่ ๒๘ มกราคม ๒๕๖๔ คือในวันที่ ๒ กันยายน ๒๕๖๖ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ห้าหมื่นสี่พัน...

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางริกาญจน์ อัครสกุลวิไล)

(นางริกาญจน์ อัครสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์และประเมินผล
กรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนากลุ่มพืชโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลของห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๑๕

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@div.mail.go.th



ชุดมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลของห้องปฏิบัติการ กรมโรงงานอุตสาหกรรม



ที่ อก ๐๓๓๐(๓)/ ๖๑๒๕



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๓ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๐ มีนาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐
ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการ
วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการ
วิเคราะห์ จากเดิม นางสาวศิริกมล มงคลจิราวุฒิ ทะเบียนเลขที่ ๖-๒๐๔-จ-๑๙๓๙๙ เป็น นางสาวณัฐธยา มงคลจิราวุฒิ
ทะเบียนเลขที่ ๖-๒๐๔-จ-๑๙๓๙๙

ทั้งนี้ หากท่านมีความประสงค์จะยื่นคำขอใดๆ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์
ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม คำพงษ์)
ผู้อำนวยการกองวิเคราะห์และเฝ้าระวังมลพิษทางอากาศ
ปฏิบัติการทางเคมีและชีวเคมี กรมโรงงานอุตสาหกรรม

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๓๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๓๑๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@div.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



อุตสาหกรรมจังหวัด กรุงเทพมหานคร สำนักงาน อุตสาหกรรมจังหวัด



ที่ อก ๐๓๓๐(๓)/ ๖๔๗๐



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๔ มิถุนายน ๒๕๖๕

เรื่อง ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่ยังมีถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารเคมีที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ๖-๒๐๒ สถานที่ตั้งเลขที่
๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอลำปาง จังหวัดลำปาง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) นายเดช ช้างชน	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๖๒
๒) นางวิลาวัลย์ บริรักษ์	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๓๓
๓) นายสุพจน์ สลมนิธิ	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๔๔

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) นางสาวณัฐธยา มงคลจิราวุฒิ	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๔๕
๒) นางพจนา สีตา	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๖๖
๓) นางสาวอนิศา กุลสุริวงศ์	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๘๗
๔) นายพิทยา ทองแดง	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๘๘
๕) นางชลธิชา สูงเกษ	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๘๙
๖) ว่าที่ ร.ต.รมชัย ม่วงมา	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๐
๗) นายวรวิทย์ ทับทา	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๑
๘) นายศักดิ์รินทร์ จรัสกาย	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๒
๙) นายสุรศักดิ์ สาชิน	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๓
๑๐) นางสาวพรพรรณ ภาณุตานนท์	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๔
๑๑) นายสราพร ตามแก้ว	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๕
๑๒) นายสุทธิดำรง โชคดีนิพันธ์	ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๖

(๑๓) นายวัลลภ...

-๒-

๑๓) นายวัลลภ หันไชยเนาว์
๑๔) นางสาวนาถิ์ เจริญบุตรกุล
๑๕) นางสาวอนิศา มงคลจิราวุฒิ
๑๖) นายธนาธิปไตย วงศ์ไชย
๑๗) นายอัษฎนุสรณ์ เลิศนันทกุลชัย
๑๘) นายสังจา เพ็ชรแสง
๑๙) นายกันตภณ มณีสัมพันธ์
๒๐) นางสาวจันทิพย์ โกเมนชนะ
๒๑) นายอริณันท์ อธิจินดา
๒๒) นายคุณวุฒิ พิสมัยพันธ์
๒๓) นายคุณชัย วงศ์สุริยธาย
๒๔) นายปฐมพงศ์ กรสรวิทย์
๒๕) นายโสว ตันโพธิ์
๒๖) นางสาวกิตติยา สันตยาธิยานันท์
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง
๒๘) นางสาวเมธิวรรณ สิงห์เจ้า
๒๙) นางสาวอริศรัตน์ ศรีมงคลโร
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐี
๓๑) นายศิริวิทย์ เรืองสม
๓๒) นายปารเมศ สัตยาคุณ
๓๓) นายณัฐพล ธรรมสระโร
๓๔) นางสาวศุภรัตน์ ไส้จันทร์
๓๕) นายพชรกร อินทรเสนา
๓๖) นายพิวกร เชื้อมาก
๓๗) นายอนุวัชร ทองขจรศักดิ์
๓๘) นายอติชาต วิลาศ
๓๙) นายจักรวรรดิ ศรีวิเศษ
๔๐) นายประสาธน์มิตร เชื้อนเพชร
๔๑) นายภาณุวัฒน์ วงษ์
๔๒) นายสันติ ชัยชนะ
๔๓) นายสิทธิชัย แก้วมุก
๔๔) นายทินกร กุลชาติ

ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๗
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๘
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๔๙๙
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๐
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๑
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๒
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๓
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๔
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๕
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๖
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๗
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๘
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๐๙
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๐
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๑
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ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๓
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๔
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๕
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๖
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๗
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๘
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๑๙
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๐
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๑
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๒
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๓
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๔
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๕
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๖
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๗
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๘
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๒๙
ทะเบียนเลขที่ ๖-๒๐๒-จ-๑๙๕๓๐

ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๕ รายการ
อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๕ รายการ
ตามสิ่งที่ส่งมาด้วย

-๓-

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์
จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบ
คำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการ
วิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจินดา เศรษฐินทร)
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปฏิบัติการทางเคมีและชีวเคมี กรมโรงงานอุตสาหกรรม

๒๔ มิ.ย. ๒๕๖๕

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

ศูนย์วิจัยและเฝ้าระวังมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๓๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ divw@div.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน 7-๓๒๓

ที่ อภ ๐๓๑๐(๓)/ ๖๔๗๐ ลงวันที่ ๒๔ มิถุนายน ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

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

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁸⁾
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾
3	Opacity	Ringelmann's Method ^(3,4)
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁽⁶⁾ 2) Instrumental Analyzer Method ⁽⁹⁾
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽¹⁰⁾

วิภาดา สิมะกุล

(นางสาววิภาดา สิมะกุล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium - Thorin Titrimetric Method ⁽⁶⁾
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽⁷⁾

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ⁽²⁾
2	pH	Electrometric Method ⁽²⁾
3	Phenols	Distillation, Direct Photometric Method ⁽²⁾

เอกสารอ้างอิง

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ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร ๐ ๒๒๐-๕๕๖๒๖-๔



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ติดต่อเรา

