ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM-10)	High Volume	SGK_FS0064	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	SGK_FS0087	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0403	3-Jun-24	3-Jun-25	12
Ambient	Total Suspended Particulate	High Volume	SGK_FS0060	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	SGK_FS0062	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0403	3-Jun-24	3-Jun-25	12
Ambient	Nitrogen Dioxide	NO_2 Analyzer	BKK_FS1082	3-Jan-25	3-Jul-25	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	SGK_FS0094	4-Jan-25	4-Jul-25	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	SGK_FS0092	4-Jan-25	4-Jul-25	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	BKK_FS1084	3-Jan-25	3-Jul-25	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0036	3-Jul-24	3-Jan-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0088	23-Aug-24	23-Feb-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0089	23-Aug-24	23-Feb-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0035	3-Jul-24	3-Jan-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	SGK_FS0088	23-Aug-24	23-Feb-26	18
Ambient	Formaldehyde	Field Rotameter	SGK_FS0141	10-Jan-25	10-Apr-25	3
Ambient	Formaldehyde	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Ambient	Formaldehyde	DRYCAL FLOWMETER	BKK_FS0619	9-Sep-24	9-Sep-25	12
Ambient	Formaldehyde	Air Sampling Pump	BKK_FS0331	14-Jan-25	14-Apr-25	3
Ambient	Formaldehyde	Air Sampling Pump	SGK_FS0150	7-Jan-25	7-Apr-25	3
Ambient	Formaldehyde	Air Sampling Pump	SGK_FS0152	7-Jan-25	7-Apr-25	3
Ambient	Formaldehyde	Air Sampling Pump	SGK_FS0146	7-Jan-25	7-Apr-25	3
Ambient	Formaldehyde	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Noise	Leq 24 hrs / Leq 5 min	Sound Calibrator	SGK_FS0011	22-Oct-24	22-Oct-25	12
Noise	Leq 24 hrs / Leq 5 min	Sound Level Meter	SGK_FS0131	17-Jun-24	17-Jun-25	12
Noise	Leq 24 hrs / Leq 5 min	Sound Level Meter	SGK_FS0127	6-Feb-25	5-Feb-26	12
Noise	Leq 24 hrs / Leq 5 min	Sound Level Meter	SGK_FS0132	17-Jun-24	17-Jun-25	12
Workplace	Formaldehyde	DRYCAL FLOWMETER	BKK_FS1346	15-Jan-25	15-Jan-26	12
Workplace	Formaldehyde	DRYCAL FLOWMETER	BKK_FS1348	15-Jan-25	15-Jan-26	12
Workplace	Formaldehyde	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Methanol	DRYCAL FLOWMETER	BKK_FS1346	15-Jan-25	15-Jan-26	12
Workplace	Methanol	DRYCAL FLOWMETER	BKK_FS1348	15-Jan-25	15-Jan-26	12
Workplace	Methanol	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS1346	15-Jan-25	15-Jan-26	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS1348	15-Jan-25	15-Jan-26	12
Workplace	Total Dust	Analytical Balance 5 D.	SGK_CL0077	10-Jan-25	10-Jan-26	12
Workplace	Total Hydrocarbon	Total Hydrocarbon Analyzer	BKK_FS1068	11-Dec-23	11-Jun-25	18
Noise	Leq 8 hrs	Sound Calibrator	SGK_FS0011	22-Oct-24	22-Oct-25	12
Noise	Leq 8 hrs	Sound Level Meter	SGK_FS0013	1-Oct-24	1-Oct-25	12
Noise	Leq 8 hrs	Sound Level Meter	SGK_FS0023	9-Jan-25	9-Jan-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	SGK_FS0102	13-Feb-25	12-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	SGK_FS0097	7-Feb-25	6-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	SGK_FS0099	7-Feb-25	6-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	SGK_FS0100	7-Feb-25	6-Feb-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	SGK_FS0006	12-Jun-24	12-Jun-25	12
Noise	Noise Dose, TWA	Dosemeter	SGK_FS0057	27-Sep-24	27-Sep-25	12
Heat	Heat Stress	Heat Stress Monitor	SGK_FS0103	23-Aug-24	23-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	SGK_FS0104	23-Aug-24	23-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	SGK_FS0043	2-Dec-24	2-Dec-25	12
Heat	Heat Stress	Heat Stress Monitor	SGK_FS0107	26-Aug-24	26-Aug-25	12
Illuminance	Illuminance	Lux Meter	SGK_FS0020	26-Aug-24	26-Aug-25	12
Songkhla Lab	BOD	Incubator	SGK_CL0028	10-Jan-25	10-Jul-26	18
Songkhla Lab	BOD	DO/BOD Analyser	SGK_CL0073	21-May-24	21-Nov-25	18

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Songkhla Lab	COD	COD Reactor	SGK_CL0085	15-Jan-25	15-Jan-26	12
Songkhla Lab	COD	Spectrophotometer	SGK_CL0100	25-Dec-24	25-Dec-25	12
Songkhla Lab	Formaldehyde	Spectrophotometer	SGK_CL0040	15-Jan-25	15-Jan-26	12
Songkhla Lab	Formaldehyde	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18

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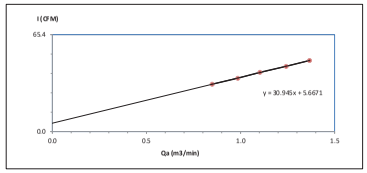
รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Songkhla Lab	pH at 25 °C	pH meter	SGK_CL0030	19-Oct-24	19-Apr-26	18
Songkhla Lab	Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	10-Jan-25	10-Jan-26	12
Songkhla Lab	Oil & Grease	Oven	SGK_CL0024	19-Oct-24	19-Apr-26	18
Songkhla Lab	Oil & Grease	Water Bath	SGK_CL0035	10-Jan-25	10-Jul-26	18
Songkhla Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	SGK_CL0045	10-Jan-25	10-Jan-26	12
Songkhla Lab	Total Dissolved Solids 180°C	Oven	SGK_CL0024	19-Oct-24	19-Apr-26	18
Songkhla Lab	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	10-Jan-25	10-Jan-26	12
Songkhla Lab	Total Suspended Solids	Oven	SGK_CL0024	19-Oct-24	19-Apr-26	18
Songkhla Lab	Conductivity	Conductivity Meter	SGK_CL0032	6-May-24	6-May-25	12
Songkhla Lab	Total Coliform	Autoclave	SGK_ML0001	1-Jul-24	1-Jan-26	18
Songkhla Lab	Total Coliform	Incubator	SGK_ML0013	15-Jan-24	15-Jul-25	18
Songkhla Lab	Total Coliform	pH Meter	SGK_ML0016	2-Jul-24	2-Jan-26	18
Songkhla Lab	Total Coliform	Water Bath	SGK_ML0021	1-Jul-24	1-Jan-26	18
Songkhla Lab	Fecal Coliform	Autoclave	SGK_ML0001	1-Jul-24	1-Jan-26	18
Songkhla Lab	Fecal Coliform	Incubator	SGK_ML0013	15-Jan-24	15-Jul-25	18
Songkhla Lab	Fecal Coliform	pH Meter	SGK_ML0016	2-Jul-24	2-Jan-26	18
Songkhla Lab	Fecal Coliform	Water Bath	SGK_ML0021	1-Jul-24	1-Jan-26	18
Songkhla Lab	Arsenic	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Arsenic	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Cadmium	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Cadmium	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Chromium	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Chromium	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Copper	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Copper	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Iron	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Iron	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Lead	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Lead	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Zinc	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Zinc	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Songkhla Lab	Mercury	ICP-MS	SGK_CL0048	4-Feb-25	3-Aug-26	18
Songkhla Lab	Mercury	Cold Room	SGK_CL0065	1-Jul-24	1-Jan-26	18
Water Lab	Sulfate	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Ammonia Nitrogen	Discrete analyzer	BKK_EN0037	16-Aug-24	16-Aug-25	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12

High Volume Air Sampler Calibration Worksheet

Project Site :	AICA Hatyai Co,Ltd.	**Barometric Pressure (mm Hg) :**	756.3
Calibrate Location :	บริเวณบ่านย่านางา (A1)	**Temperature (°C) :**	31.3
Calibrate Date :	9-May-25	**High Volume ID :**	SGK_FS0064
CalibrationSheet No.:	C-090525-SGK_FS0064	**High Volume Model :**	TE-5009X
Calibrator ID:	SGK_FS0083	**High Volume S/N :**	5579
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.02098
Calibrator S/N :	3888	**Calibrator Intercept :**	-0.06367

Test No.	Delta H_2O (inch)	Qa (m^3/min)	I : Chart (CFM)	Linear Regression
1	1.6	0.850	32	Slope : 30.9455
2	2.2	0.985	36	Intercept : 5.6671
3	2.8	1.103	40	Correlation Coefficient : 0.9998
4	3.6	1.242	44	
5	4.4	1.367	48	



Calibrated by Narathorn k

(Mr. Narathorn Keawpongsa)
SGK Field Services Scientist (1)

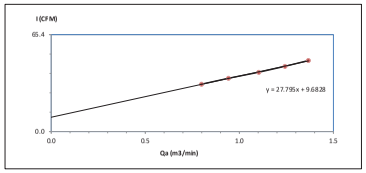
Approved by : Supot S

(Mr. Supot Salamteh)
RYG Field Services Section Head

High Volume Air Sampler Calibration Worksheet

Project Site :	AICA Hatyai Co,Ltd.	**Barometric Pressure (mm Hg) :**	756.3
Calibrate Location :	บริเวณบ่านย่านางา (A2)	**Temperature (°C) :**	31.3
Calibrate Date :	9-May-25	**High Volume ID :**	SGK_FS0087
CalibrationSheet No.:	C-090525-SGK_FS0087	**High Volume Model :**	TE-5009X
Calibrator ID:	SGK_FS0083	**High Volume S/N :**	5993
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.02098
Calibrator S/N :	3888	**Calibrator Intercept :**	-0.06367

Test No.	Delta H_2O (inch)	Qa (m^3/min)	I : Chart (CFM)	Linear Regression
1	1.4	0.799	32	Slope : 27.7952
2	2.0	0.942	36	Intercept : 9.6828
3	2.8	1.103	40	Correlation Coefficient : 0.9991
4	3.6	1.242	44	
5	4.4	1.367	48	



Calibrated by Narathorn k

(Mr. Narathorn Keawpongsa)
SGK Field Services Scientist (1)

Approved by : Supot S

(Mr. Supot Salamteh)
RYG Field Services Section Head

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
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NBC-TISI-TISI17025 CALIBRATION 0378

CERTIFICATE OF CALIBRATION

Certificate No. : PST-0126-24 **W/O No. : WO-0051-24**

Customer

Company : ALS LABORATORY GROUP (THAILAND) CO., LTD.
Address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan,
City / Province : Khet Suan Luang, Bangkok
Zip/Postal : 10250

Device

Equipment : Electronic Balance — Capacity : 120 / 220 g
Manufacturer : OHAUS — Readability : 0.00001 / 0.0001 g
Model : EX225D/AD — ID No. : BKK_EN0403
Serial No. : C309774648
Condition : Normal

Environment Conditions

Location of Calibration	: Enviroment Lab			
Ambient Temperature	: 20.1	(°C)	± 3	°C
Relative Humidity	: 70.3	(%RH)	± 15	%RH
Barometric Pressure	: 1011.1	(mba)	± 10	hPa
Comment	:			

REVIEW BY ... Juda K
APPROVED BY Sriluk P.
NEXT CAL. DATE 03/01/25

Date of Receipt : June 3, 2024
Date of Calibration : June 3, 2024
Issue Date : June 5, 2024

Calibrated by : Mr.Kittichai Rattanatham — Approved by (Mr.Kittichai Rattanatham)
Calibrator — Approved Signature

The reported measurement result relates only to the measurand and applies only at the time of measurement.

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit 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 prior written approval of the calibration center, Play Solution Technology Co.,Ltd

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NBC-TISI-TISI17025 CALIBRATION 0378

CERTIFICATE OF CALIBRATION

Certificate No. : PST-0126-24 **W/O No. : WO-0051-24**

Result of Calibration : Without Adjustment

1. Repeatability

Weighing Range 1 g	Nominal Value g	Standard Deviation g
Max.capacity 220	50	0.000012
	200	0.000048

2.Linearity, Departure of Indication from nominal value

Weighing Range 1

Nominal Value g	Standard Value g	Indication g	Error of Indication g	Expanded Uncertainty g	Factor k
0.01	0.01000	0.01000	-0.000001	0.000082	2.87
0.1	0.10001	0.10001	0.000004	0.000082	2.87
0.5	0.50000	0.50001	0.000012	0.00008	2.87
1	1.00001	1.00002	0.000013	0.00008	2.87
5	5.00002	5.00003	0.000009	0.00008	2.52
10	9.99999	9.99999	-0.000001	0.00008	2.28
50	50.00001	49.99998	-0.000027	0.00016	2.00
100	100.00002	100.00002	0.000004	0.00030	2.00
150	150.00002	150.0001	0.000077	0.00045	2.00
200	200.00003	200.0001	0.000068	0.00060	2.00

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CERTIFICATE OF CALIBRATION

Certificate No. : PST-0126-24 **W/O No. : WO-0051-24**

Result of Calibration

3.Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1
Test Load : 100 g

Position	Indication g
1	100.00004
2	100.00005
3	100.00002
4	100.00004
5	100.00003
Max.Deviation	0.00002

Standard method

The calibration was performed by using calibration laboratory's in-house calibration method : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

Instrument	OIML Class	S/N	Certificate No.	Due Date
Standard Weight Set	E2	4000021952	22-128725	November 30, 2024
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to UKAS M3003.

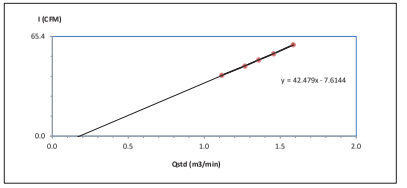
Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)
- Through the reference calibration laboratory of Asia Medical and Agricultural Laboratory and Research Center Co.,Ltd

END OF REPORT

High Volume Air Sampler Calibration Worksheet

Project Site :	AICA Hatyai Co,Ltd.	**Barometric Pressure (mm Hg) :**	756.3
Calibrate Location :	บริเวณบ่านย่านางา (A1)	**Temperature (°C) :**	31.3
Calibrate Date :	9-May-25	**High Volume ID :**	SGK_FS0060
CalibrationSheet No.:	C-090525-SGK_FS0060	**High Volume Model :**	TE-5170D
Calibrator ID:	SGK_FS0083	**High Volume S/N :**	5586
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.63052
Calibrator S/N :	3888	**Calibrator Intercept :**	-0.10231

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1154	40	Slope : 42.4792
2	3.7	1.2669	46	Intercept : -7.6144
3	4.3	1.3578	50	Correlation Coefficient : 0.9995
4	5.0	1.4561	54	
5	6.0	1.5853	60	



Calibrated by Narathorn k

(Mr. Narathorn Keawpongsa)
SGK Field Services Scientist (1)

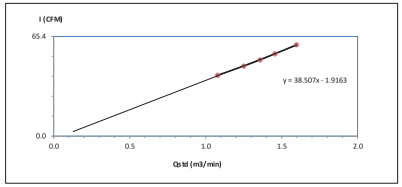
Approved by : Supot S

(Mr. Supot Salamteh)
RYG Field Services Section Head

High Volume Air Sampler Calibration Worksheet

Project Site :	AICA Hatyai Co.,Ltd.	Barometric Pressure (mm Hg) :	756.3
Calibrate Location :	บริเวณชุมชนม่านพยาวออก (A2)	Temperature (°C) :	31.3
Calibrate Date :	9-May-25	High Volume ID :	SGK_FS0062
CalibrationSheet No.:	C-090525-SGK_FS0062	High Volume Model :	TE-5170
Calibrator ID:	SGK_FS0083	High Volume S/N :	5588
Calibrator Model :	TE-5028A	Calibrator Slope :	1.63052
Calibrator S/N :	3888	Calibrator Intercept :	-0.10231

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression
1	2.6	1.0785	40	Slope : 38.5074
2	3.6	1.2510	46	Intercept : -1.9163
3	4.3	1.3578	50	Correlation Coefficient : 0.9989
4	5.0	1.4561	54	
5	6.1	1.5976	60	



Calibrated by : Narathorn K.
(Mr. Narathorn Keawpongsa)
SGK Field Services Scientist (1)

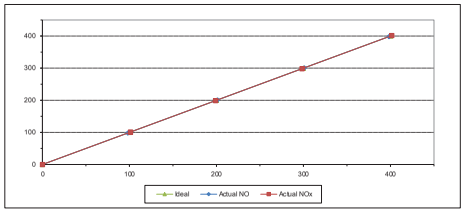
Approved by : Supot S.
(Mr. Supot Salamteh)
RYG Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	X36UJ8C0	Equipment ID	BKK_FS1082
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.86	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	98.10	-1.90	-1.90	101.30	1.30	1.30
2	200.00	201.30	1.30	0.65	199.00	-1.00	-0.50
3	300.00	301.00	1.00	0.33	298.40	-1.60	-0.53
4	400.00	398.30	-1.70	-0.42	401.50	1.50	0.38
AVERAGE (%)				-0.25			0.15



Calibrated By
(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

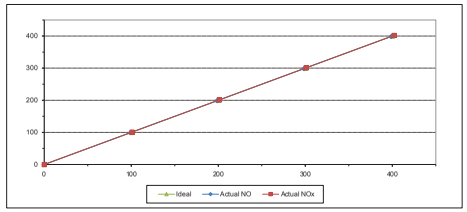
Approved By
(Mr.Sarayuth Jittranont)
Assistant General Manager

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

MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	NK6RT3TF	Equipment ID	SGK_FS0094
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.86	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	100.90	0.90	0.90
2	200.00	198.50	-1.50	-0.75	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	301.00	1.00	0.33
4	400.00	398.80	-1.20	-0.30	402.10	2.10	0.53
AVERAGE (%)				-0.45			0.50



Calibrated By
(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

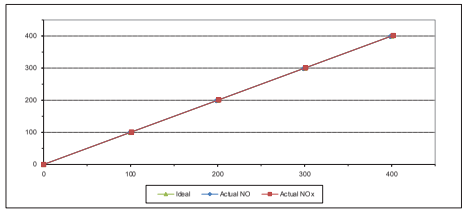
Approved By
(Mr.Sarayuth Jittranont)
Assistant General Manager

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

MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	WNBBGLLL	Equipment ID	SGK_FS0092
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.86	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.10	1.10	1.10
2	200.00	198.50	-1.50	-0.75	201.30	1.30	0.65
3	300.00	298.70	-1.30	-0.43	301.10	1.10	0.37
4	400.00	398.50	-1.50	-0.38	401.80	1.80	0.45
AVERAGE (%)				-0.45			0.53



Calibrated By
(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

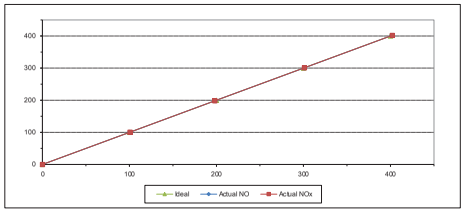
Approved By
(Mr.Sarayuth Jittranont)
Assistant General Manager

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

MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jan-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	WJ36T7NG	Equipment ID	BKK_FS1084
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.86	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	100.10	0.10	0.10	100.70	0.70	0.70
2	200.00	198.50	-1.50	-0.75	198.20	-1.80	-0.90
3	300.00	301.20	1.20	0.40	301.10	1.10	0.37
4	400.00	401.50	1.50	0.38	402.10	2.10	0.53
AVERAGE (%)				0.04			0.16



Calibrated By
(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By
(Mr.Sarayuth Jittranont)
Assistant General Manager

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

JNAC
JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Wutthayna, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +66(0)8008312
Mobile: +66(0)899945
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Air speed measurement laboratory
Calibration services department.

ilac-MRA
NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS-023-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM	: Cup anemometer
MANUFACTURER	: Novalynx
MODEL/TYPE	: Sensor: WS-02F Data logger: 200-WS-25LB
SERIAL NUMBER	: Sensor: WSD-A5193 Data logger: A5193
ID NUMBER	: SGK_FS0036
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 27 Jun 2024
MEASUREMENT DATE	: 03 Jul 2024
ISSUE DATE	: 03 Jul 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITIONS

: Wind tunnel cross-section area [1]	900	cm^2
Wind direction frontal area [2]	100	cm^2
Diameter of mounting pipe [3]	-	mm
Blockage ratio of test object [4]	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.9) °C, (50.0) %RH and (1005.3) hPa.

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

Calibrated by:
☑ Mr. Sorawit Thachobol
☐ Miss Jittraporn Lertsompisit

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY
APPROVED BY
ISSUE DATE 3/7/26

Remark:
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [1]/[2]

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

Certificate Number
CWS-023-67

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{std} [2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{UUC} (m/s)	Error (m/s)	*U (k=2)* (m/s)
0.997	24.00	23.85	0.9	-0.1	0.31
2.015	23.70	23.85	1.8	-0.2	0.31
2.990	23.90	23.85	2.9	-0.1	0.31
4.100	23.92	23.85	3.9	-0.2	0.31
4.95	23.80	23.85	5.0	0.0	0.31
5.98	24.00	23.85	6.0	0.0	0.31
7.04	23.62	23.85	7.1	0.0	0.31
7.98	24.00	23.85	8.0	0.0	0.31
9.06	23.62	23.85	9.1	0.0	0.31
10.00	24.04	23.85	10.1	0.1	0.31
11.00	23.66	23.85	11.1	0.1	0.31
12.01	23.90	23.85	12.2	0.1	0.31
13.01	23.70	23.85	13.1	0.1	0.31
14.05	23.80	23.85	14.2	0.2	0.31
15.05	23.70	23.85	15.2	0.1	0.31
16.00	23.76	23.85	16.3	0.3	0.31

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

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

Wind direction measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
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Bangkok 10600(Thailand)
Tel: +66896808812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Certificate Number
CWD-023-67

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 200-WS-25LB
SERIAL NUMBER : Sensor: WSD-AS193
Data logger: AS193
ID NUMBER : SGK_FS0036
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 27 Jun 2024
MEASUREMENT DATE : 03 Jul 2024
ISSUE DATE : 03 Jul 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITION

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.9)°C, (47.2) %RH and (1008.9) hPa.

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

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model: AX40975-DMD4-P3-S-UD in an close test-section of Eiffel-type wind tunnel with 900 cm^2 cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Pariwya Booncharoen
Calibration Department Manager

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

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

Certificate Number
CWS-032-67

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{std} [2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{UUC} (m/s)	Error (m/s)	*U (k=2)* (m/s)
1.047	23.40	23.60	0.9	-0.1	0.31
2.008	23.60	23.60	1.8	-0.2	0.31
2.975	23.24	23.60	2.8	-0.2	0.31
4.042	23.26	23.60	3.8	-0.2	0.31
4.98	23.32	23.60	5.0	0.0	0.31
5.96	23.38	23.60	6.0	0.0	0.31
7.03	23.20	23.60	7.1	0.1	0.31
7.97	23.22	23.60	8.1	0.1	0.31
8.98	23.10	23.60	9.1	0.1	0.31
9.96	23.10	23.60	10.1	0.2	0.31
10.94	23.18	23.60	11.1	0.2	0.31
12.01	23.10	23.60	12.3	0.3	0.31
12.93	23.20	23.60	13.2	0.3	0.31
14.07	23.10	23.60	14.3	0.2	0.31
15.00	23.18	23.60	15.3	0.3	0.31
15.99	23.12	23.60	16.3	0.3	0.31

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

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

Air speed measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +66896808812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Certificate Number
CWS-032-67

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-AS791
Data logger: AS791
ID NUMBER : SGK_FS0088
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 23 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITIONS

: Wind tunnel cross-section area[1]	900	cm^2
Wind direction frontal area[2]	100	cm^2
Diameter of mounting pipe[3]	-	mm
Blockage ratio of test object[4]	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.6) °C, (48.4) %RH and (1000.0) hPa.

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

Calibration procedure:
The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm^2 cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

REVIEW BY
APPROVED BY
NEXT CAL. DATE 25/2/26

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Pariwya Booncharoen
Calibration Department Manager

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

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

Certificate Number
CWD-023-67

MEASUREMENT RESULTS [5]

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

Air speed m/s	D°_{std} Degree (°)	D°_{UUC} Degree (°)	Error Degree (°)	*U (k=2)* Degree (°)
5.00	45.000	42	-3	0.80
	90.000	88	-2	0.80
	135.000	132	-3	0.80
	180.000	180	0	0.80
	225.000	227	2	0.80
	270.000	273	3	0.80
	315.000	318	3	0.80
	360.000	359	-1	0.80

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
[3] Direction of Unit Under Calibration

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

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

Wind direction measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +66896808812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Certificate Number
CWD-032-67

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-AS791
Data logger: AS791
ID NUMBER : SGK_FS0088
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 23 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITION

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.2)°C, (43.7) %RH and (1007.7) hPa.

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

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model: AX40975-DMD4-P3-S-UD in an close test-section of Eiffel-type wind tunnel with 900 cm^2 cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Pariwya Booncharoen
Calibration Department Manager

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

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

Certificate Number
CWD-032-67

MEASUREMENT RESULTS [5]

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

Air speed m/s	D'_{std} Degree (°)	D'_{unc} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.04	45.000	42	-3	0.80
	90.000	88	-2	0.80
	135.000	135	0	0.80
	180.000	182	2	0.80
	225.000	228	3	0.80
	270.000	273	3	0.80
	315.000	318	3	0.80
	360.000	359	-1	0.80

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
[3] Direction of Unit Under Calibration

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.
Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +66(0)8608081812
Mobile: +66(0)863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-012-67

MEASUREMENT ITEM : Digital barometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: 110-WS-25BP
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: BP-A5791
Data logger: A5791
ID NUMBER : SGK_FS0088
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 16 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 23 Aug 2024

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

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

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

CONDITION OF THIS RESULT OF CALIBRATION:
1. Reference Standard Instrument:

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

1. Calibration effort for calibration sequence C
2. The UUC* was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.
3. Calibration conditions:
4. Condition : ☑ Normal ☐ Abnormal
Pressure transmitting medium : Air
ρ_N (20°C, 1 bar) : 1.19 kg/m³
H_{amb} : (55±15) %
t_{amb} : (23±3) °C
P_{amb} : (1010±10) mbar
5. The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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

JIRANATEE ASSOCIATES CO.,LTD.
Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +66(0)8608081812
Mobile: +66(0)863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-012-67

MEASUREMENT RESULTS : ☐ Without adjustment ☑ With adjustment
CALIBRATION IN THE RANGE OF : 950 mbar to 1050 mbar

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

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.03	951.6	1.6	0.37
970.01	971.3	1.3	0.37
989.96	990.8	0.9	0.39
1010.03	1010.4	0.4	0.37
1030.02	1030.0	0.0	0.40
1050.02	1049.4	-0.6	0.40

Note: UUC* Unit Under Calibration
: To convert the result in report unit to Pa should be multiply by 100

End of certificate

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.
Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Air speed measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS-033-67

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
Sensor: WSD-A5792
SERIAL NUMBER : Data logger: A5792
ID NUMBER : SGK_FS0089
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 23 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITIONS : Wind tunnel cross-section area[1] 900 cm²
Wind direction frontal area[2] 100 cm²
Diameter of mounting pipe[3] - mm
Blockage ratio of test object[4] 0.111 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.6) °C, (49.0) %RH and (1004.6) hPa.

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

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

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

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

REVIEW BY Nitankorn P.
APPROVED BY
NEXT CAL. DATE 25/2/26

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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

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

Certificate Number
CWS-033-67

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{ref} [2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{unc} [3] (m/s)	Error (m/s)	U (k=2) (m/s)
1.031	23.44	23.55	0.9	-0.1	0.31
2.029	23.58	23.55	1.8	-0.2	0.31
2.994	23.20	23.55	2.9	-0.1	0.31
4.064	23.24	23.55	3.9	-0.2	0.31
4.98	23.28	23.55	5.0	0.0	0.31
5.97	23.30	23.55	6.0	0.0	0.31
7.03	23.30	23.55	7.2	0.2	0.31
7.98	23.40	23.55	8.1	0.1	0.31
8.98	23.10	23.55	9.2	0.2	0.31
9.97	23.26	23.55	10.1	0.1	0.31
10.94	23.14	23.55	11.3	0.3	0.31
12.02	23.16	23.55	12.4	0.3	0.31
12.95	23.20	23.55	13.4	0.4	0.31
14.08	23.10	23.55	14.6	0.4	0.31
15.01	23.20	23.55	15.5	0.5	0.31
16.00	23.30	23.55	16.5	0.5	0.31

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.
Jiranatee Associates Co.,Ltd
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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWD-033-67

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5792
Data logger: A5792
ID NUMBER : SGK_FS0089
CONDITION AS-RECEIVED : Used items
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 16 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 23 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITION : Wind tunnel cross-section area[1] 900 cm²
Wind direction frontal area[2] 129 cm²
Diameter of mounting pipe[3] - mm
Blockage ratio of test object[4] 0.143 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.3)°C, (49.2) %RH and (1005.2) hPa.

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

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model: AK400T5-DM06K-P3-S-U0 in an close test section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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

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

Certificate Number
CWD-033-67

MEASUREMENT RESULTS [5]

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'_{ind} Degree (°)	D'_{mea} Degree (°)	Error Degree (°)	$U_{(k=2)}$ Degree (°)
5.04	45.000	41	-4	0.80
	90.000	88	-3	0.80
	135.000	133	-2	0.80
	180.000	181	1	0.80
	225.000	229	4	0.80
	270.000	273	3	0.80
	315.000	318	3	0.80
	360.000	359	-1	0.80

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
[3] Direction of Unit Under Calibration

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
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Accredited calibration laboratory
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NSC-TISI-TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWD-022-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 200-WS-25LB
SERIAL NUMBER : Sensor: WSD-A5192
Data logger: A5192
ID NUMBER : SGK_FS0035
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 27 Jun 2024
MEASUREMENT DATE : 03 Jul 2024
ISSUE DATE : 03 Jul 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITION

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.9)°C, (48.2) %RH and (1008.5) hPa.

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

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder, model: AX40915-DN404-P3-S-L00 in an close test-section of Eiffel-type wind tunnel with 900 cm^2 cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

Calibrated by:
☑ Mr. Sorawit Thatsalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Parinya Boonchareon
Calibration Department Manager

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

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

JIRANATEE ASSOCIATES CO.,LTD.

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NSC-TISI-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS-022-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 200-WS-25LB
SERIAL NUMBER : Sensor: WSD-A5192
Data logger: A5192
ID NUMBER : SGK_FS0035
CONDITION AS-RECEIVED : Used Item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 27 Jun 2024
MEASUREMENT DATE : 03 Jul 2024
ISSUE DATE : 03 Jul 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

CALIBRATION CONDITIONS

: Wind tunnel cross-section area[1]	900	cm^2
Wind direction frontal area[2]	100	cm^2
Diameter of mounting pipe[3]	-	mm
Blockage ratio of test object[4]	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.1) °C, (48.8) %RH and (1005.7) hPa.

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

Calibration procedure:
The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-32 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm^2 cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

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

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

REVIEW BY
APPROVED BY
ISSUE DATE 3/1/26

Calibrated by:
☑ Mr. Sorawit Thatsalad
☐ Miss Jittraporn Lertsomphol

Approved signatory:
Mr. Parinya Boonchareon
Calibration Department Manager

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

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

Certificate Number
CWD-022-67

MEASUREMENT RESULTS [5]

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'_{ind} Degree (°)	D'_{mea} Degree (°)	Error Degree (°)	$U_{(k=2)}$ Degree (°)
5.03	45.000	42	-3	0.80
	90.000	87	-3	0.80
	135.000	132	-3	0.80
	180.000	178	-2	0.80
	225.000	227	2	0.80
	270.000	274	4	0.80
	315.000	319	4	0.80
	360.000	359	-1	0.80

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
[3] Direction of Unit Under Calibration

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

Certificate Number
CWS-022-67

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{ref}[2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{mea}[3] (m/s)	Error (m/s)	$U_{(k=2)}$ (m/s)
1.005	24.10	24.10	0.9	-0.1	0.31
2.008	24.10	24.10	1.8	-0.2	0.31
2.982	24.10	24.10	3.0	0.0	0.31
4.099	24.10	24.10	3.9	-0.2	0.31
4.98	24.00	24.10	5.1	0.1	0.31
5.99	24.26	24.10	6.1	0.1	0.31
7.04	23.86	24.10	7.2	0.2	0.31
7.99	24.06	24.10	8.1	0.1	0.31
9.04	23.62	24.10	9.2	0.2	0.31
10.00	23.86	24.10	10.2	0.2	0.31
10.99	23.60	24.10	11.3	0.3	0.31
11.99	23.70	24.10	12.2	0.2	0.31
12.99	23.68	24.10	13.3	0.3	0.31
14.03	23.66	24.10	14.4	0.4	0.31
15.05	23.60	24.10	15.4	0.4	0.31
15.98	23.70	24.10	16.4	0.4	0.31

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

ALS

ROTA METER CALIBRATION RESULT JANUARY 2025

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R^2)
BKK_FS0573	09 Jan 25	Y = 1.0442x + 3.4629	0.9998
BKK_FS0577	10 Jan 25	Y = 1.101x + 2.2422	0.9995
BKK_FS0584	10 Jan 25	Y = 1.0176x + 3.74	0.9995
BKK_FS0585	10 Jan 25	Y = 1.0344x + 0.9767	0.9999
BKK_FS0587	10 Jan 25	Y = 1.0176x + 6.3433	0.9998
BKK_FS0591	10 Jan 25	Y = 0.9994x + 18.562	1.0000
BKK_FS0592	10 Jan 25	Y = 0.9996x + 12.927	1.0000
BKK_FS0594	10 Jan 25	Y = 1.0023x + 10.499	1.0000
BKK_FS1006	09 Jan 25	Y = 1.0547x + 3.8765	0.9995
BKK_FS1007	10 Jan 25	Y = 1.112x + 1.4085	0.9996
BKK_FS1008	10 Jan 25	Y = 1.1369x + 0.3976	0.9988
BKK_FS1009	09 Jan 25	Y = 0.9987x + 12.063	0.9996
BKK_FS1017	10 Jan 25	Y = 1.0649x + 4.4133	0.9994
BKK_FS1018	10 Jan 25	Y = 1.0108x + 4.3333	0.9999
BKK_FS1019	10 Jan 25	Y = 0.9996x + 12.746	1.0000
BKK_FS1026	10 Jan 25	Y = 1.0808x + 2.8537	0.9990
BKK_FS1027	10 Jan 25	Y = 1.0223x + 4.84	0.9999
BKK_FS1028	10 Jan 25	Y = 1.0011x + 15.808	1.0000
BKK_FS1039	09 Jan 25	Y = 0.9987x + 12.063	0.9996
BKK_FS1040	09 Jan 25	Y = 1.0013x + 3.9257	1.0000
BKK_FS1041	09 Jan 25	Y = 1.0299x + 3.5058	0.9999
BKK_FS1042	09 Jan 25	Y = 1.0058x + 10.903	0.9993
BKK_FS1044	09 Jan 25	Y = 1.1297x + 1.8599	0.9994
PHK_FS0027	10 Jan 25	Y = 1.0823x + 3.8912	1.0000
PHK_FS0028	10 Jan 25	Y = 1.0056x + 8.4067	0.9998
PHK_FS0029	10 Jan 25	Y = 1x + 14.547	1.0000
RYG_FS0195	09 Jan 25	Y = 1.0041x + 8.7581	1.0000
RYG_FS0196	09 Jan 25	Y = 0.9994x + 16.56	1.0000
RYG_FS0197	09 Jan 25	Y = 1.0021x + 13.837	1.0000
RYG_FS0198	09 Jan 25	Y = 0.9975x + 17.805	0.9999
RYG_FS0199	09 Jan 25	Y = 1.0294x + 4.9105	0.9997
RYG_FS0627	09 Jan 25	Y = 1.0235x + 4.83	1.0000
RYG_FS0628	09 Jan 25	Y = 1.0222x + 3.63	0.9999
RYG_FS0654	09 Jan 25	Y = 1.0857x - 0.0238	1.0000
RYG_FS0655	09 Jan 25	Y = 0.9928x + 10.99	1.0000
RYG_FS0656	09 Jan 25	Y = 1.003x + 9.5419	1.0000
RYG_FS0657	09 Jan 25	Y = 1.026x + 3.483	0.9998
RYG_FS0658	09 Jan 25	Y = 1.0173x + 3.57	0.9999
RYG_FS0659	09 Jan 25	Y = 1.0003x + 11.785	1.0000

ROTA METER CALIBRATION RESULT JANUARY 2025

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R^2)
SGK_FS0135	10 Jan 25	Y = 1.0205x + 4.58	0.9999
SGK_FS0136	10 Jan 25	Y = 1.0299x + 1.5233	0.9999
SGK_FS0138	10 Jan 25	Y = 1.0865x + 3.4633	1.0000
SGK_FS0139	10 Jan 25	Y = 1.0186x + 4.9267	0.9996
SGK_FS0140	10 Jan 25	Y = 0.9997x + 15.3	1.0000
SGK_FS0141	10 Jan 25	Y = 1.1165x + 2.6633	0.9999
SGK_FS0142	10 Jan 25	Y = 1.0162x + 4.9767	0.9999
SGK_FS0143	10 Jan 25	Y = 1.0025x + 10.838	1.0000

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

Approved By : (Mr.Sarayuth Jittranont), Assistant General Manager

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate of Calibration

Customer

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

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Unit Under Calibration Details

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

Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

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

REVIEW BY Nonglerm P.
APPROVED BY
NEXT CAL. DATE 9/9/25

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

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

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

Calibration By : Mr. Noppadon Luangart, Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn, Calibration Engineer Supervisor

Issue Date : 9 September 2024

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TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Result of Calibration : Without Adjustment

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

Note
STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

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

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

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Decision Rule for Statements of Conformity

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

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

Pass[1] = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail[1] = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate of Calibration

Customer

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

Certificate No : 24-AFM-177
Request No : Req-2024-1862

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130026
ID : BKK_FS0619
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 22 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY Nonglerm P.
APPROVED BY
NEXT CAL. DATE 9/9/25

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

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

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

Calibration By : Mr. Noppadon Luangart, Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn, Calibration Engineer Supervisor

Issue Date : 9 September 2024

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TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 24-AFM-177
Request No : Req-2024-1862

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.92	20	20.192	0.2	1.3	0.2	N/A
24.70	100.90	100	99.923	-0.1	2.8	1.0	N/A
24.70	100.94	201	200.7	-0.3	5.6	2.0	N/A
24.70	100.97	298	300.1	2.1	8.4	3.0	N/A
24.70	100.99	403	399.1	-4	11	4.0	N/A
24.80	101.05	482	477.6	-4.4	6.9	4.8	N/A

Note
STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

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

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

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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7 139 MOO 13, SOI SUNTHAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 16600-2116-5860-1 FAX: 16600-2116-7140

Certificate No : 24-AFM-177

Request No : Req-2024-1862

Decision Rule for Statements of Conformity

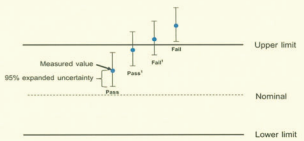
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass[1] = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail[1] = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Calibration No. : C-140125-BKK_FS0331

Air Sampling Pump Calibration Report

Air Sampling Pump Detail			
Calibration Date	14 Jan 2025	**Next cal.**	14 Apr 2025
Air Sampling Pump ID	BKK_FS0331	**Barometic (mmHg)**	757
Serial No.	20150910083	**Temperature (°C)**	25.0

Reference Standard Low Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0619
Model	Defender 510-L	**Serial No.**	130026
Due Date	9-Sep-25		

Reference Standard High Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0614
Model	Defender 510-M	**Serial No.**	151114
Due Date	9-Sep-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/m			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.8	20.1	20.0	20.3	21	19	Passed
50	50.4	49.8	49.5	49.9	52.5	47.5	Passed
100	100.3	99.2	99.4	99.6	105	95	Passed
200	203.6	201.7	201.5	202.3	210	190	Passed
500	503.5	502.9	502.9	503.1	515	485	Passed
1000	1000.4	996.9	1002.8	1000.0	1010	990	Passed
2000	2004.3	2003.9	2004.0	2004.1	2020	1980	Passed
2500	2501.2	2497.6	2496.8	2498.5	2550	2450	Passed

Note : Reference Specifications ± 5% of set flow or ± 3% cc/min whichever is Higher

Calibrated by : Phuwich (Mr.Phuwich Promsaard) Enviro Field Services

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

FORM NO.: F 06-115 REVISION NO.: 1 ISSUE DATE: 10/04/24

Calibration No. : C-070125-SGK_FS0150

Air Sampling Pump Calibration Report (add flow 4000)

Air Sampling Pump Detail			
Calibration Date	7 Jan 2025	**Next cal.**	7 Apr 2025
Air Sampling Pump ID	SGK_FS0150	**Barometic (mmHg)**	756.1
Serial No.	20170410064	**Temperature (°C)**	25.0

Reference Standard Low Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0619
Model	Defender 510-L	**Serial No.**	130026
Due Date	9-Sep-25		

Reference Standard High Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0614
Model	Defender 510-M	**Serial No.**	151114
Due Date	21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.9	20.4	20.7	20.7	21	19	Passed
50	50.1	51.3	50.7	50.7	52.5	47.5	Passed
100	98.7	99.2	99.5	99.1	105	95	Passed
200	200.1	199.8	202.3	200.7	210	190	Passed
500	504.1	500.3	499.6	501.3	515	485	Passed
1000	998.4	999.6	1000.1	999.4	1010	990	Passed
2000	2006.5	2004.3	2003.1	2004.6	2020	1980	Passed
2500	2499.5	2496.5	2500.1	2498.7	2550	2450	Passed
4000	4002.1	4005.2	4004.3	4003.9	4080	3920	Passed

Note : Reference Specifications ± 5% of set flow or ± 3% cc/min whichever is Higher

Calibrated by : (Mr.Apiwat Chanta) Enviro Field Services

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

FORM NO.: F 06-133 REVISION NO.: - ISSUE DATE: 15/10/24

Calibration No. : C-070125-SGK_FS0152

Air Sampling Pump Calibration Report (add flow 4000)

Air Sampling Pump Detail			
Calibration Date	7 Jan 2025	**Next cal.**	7 Apr 2025
Air Sampling Pump ID	SGK_FS0152	**Barometic (mmHg)**	756.1
Serial No.	20170810060	**Temperature (°C)**	25.0

Reference Standard Low Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0619
Model	Defender 510-L	**Serial No.**	130026
Due Date	9-Sep-25		

Reference Standard High Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0614
Model	Defender 510-M	**Serial No.**	151114
Due Date	21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	19.9	19.8	19.8	19.8	21	19	Passed
50	49.7	50.6	51.0	50.4	52.5	47.5	Passed
100	99.1	98.4	99.3	98.9	105	95	Passed
200	201.1	200.1	198.2	199.8	210	190	Passed
500	495.2	497.4	496.3	496.3	515	485	Passed
1000	1002.4	998.6	999.4	1000.1	1010	990	Passed
2000	1998.7	2001.3	2003.4	2001.1	2020	1980	Passed
2500	2506.1	2503.4	2502.3	2503.9	2550	2450	Passed
4000	4006.0	4008.1	4005.3	4006.5	4080	3920	Passed

Note : Reference Specifications ± 5% of set flow or ± 3% cc/min whichever is Higher

Calibrated by : (Mr.Apiwat Chanta) Enviro Field Services

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

FORM NO.: F 06-133 REVISION NO.: - ISSUE DATE: 15/10/24

Calibration No. : C-070125-SGK_FS0146

Air Sampling Pump Calibration Report (add flow 4000)

Air Sampling Pump Detail			
Calibration Date	7 Jan 2025	**Next cal.**	7 Apr 2025
Air Sampling Pump ID	SGK_FS0146	**Barometic (mmHg)**	756.1
Serial No.	20170410057	**Temperature (°C)**	25.0

Reference Standard Low Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0619
Model	Defender 510-L	**Serial No.**	130026
Due Date	9-Sep-25		

Reference Standard High Flow Meter			
Brand	MesaLabs	**ID**	BKK_FS0614
Model	Defender 510-M	**Serial No.**	151114
Due Date	21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	21.0	20.9	19.4	20.4	21	19	Passed
50	52.4	52.5	51.5	52.1	52.5	47.5	Passed
100	103.5	100.2	103.1	102.3	105	95	Passed
200	196.6	196.8	196.7	196.7	210	190	Passed
500	511.2	514.3	512.2	512.6	515	485	Passed
1000	997.8	995.2	1004.2	999.1	1010	990	Passed
2000	2011.1	2006.4	2007.1	2008.2	2020	1980	Passed
2500	2509.4	2513.6	2516.7	2513.2	2550	2450	Passed
4000	4018.4	4015.7	4016.5	4016.9	4080	3920	Passed

Note : Reference Specifications ± 5% of set flow or ± 3% cc/min whichever is Higher

Calibrated by : (Mr.Apiwat Chanta) Enviro Field Services

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

FORM NO.: F 06-133 REVISION NO.: - ISSUE DATE: 15/10/24

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd,Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: AgilentRecommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass

REVIEW BY Jinda K.
APPROVED BY Tanyatorn P.
NEXT CAL. DATE 22 Apr 2026

CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test 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 Decay

Name: 7890
Front SSL

Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.07	psi

Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass
Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.06	psi

Accuracy: 0.1 psi
Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: <= 10.0 % setpoint (3.0 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: <= 10.0 % setpoint (40.0 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: <= 10.0 % setpoint (2.5 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min
Accuracy: 0.8 mL/min
Agilent Recommended: <= 10.0 % setpoint (3.0 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 393 mL/min
Accuracy: 7.0 mL/min
Agilent Recommended: <= 10.0 % setpoint (40.0 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.2 mL/min
Accuracy: 0.2 mL/min
Agilent Recommended: <= 10.0 % setpoint (2.5 ml/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass
Zone: Oven
Setpoint/Actual
Temperature: 230.0 230.3 °C
Accuracy: 0.3 °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: 100.0 100.0 °C
Accuracy: 0.0 °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: 100.0 100.0167 °C
Stability: 0.1 °C
Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID
Injection Tower
Name: 7693A

Setpoint Status: Completed
Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID
Name: 7890
Setpoint Status: Pass
Base Signal: 14.05 pA

	ASTM Noise pA		Drift pA/Hr	
	0.05		0.03	
Agilent Recommended:	<=	0.10	<=	2.50
Status:	Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID
Name: 7693A
Setpoint Status: Pass
Injection Volume on Column: 1.0 uL
Area RSD: 0.30 % Retention Time RSD: 0.63 %
Agilent Recommended: <= 3.00 <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination1 Front SSL / Front FID
Injection Tower
Name: 7890
Setpoint Status: Pass
Signal to Noise: 11078525
Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID
Injection Tower
Name: 7693A
Setpoint Status: Completed
Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID
Name: 7890
Setpoint Status: Pass
Base Signal: 13.79 pA

	ASTM Noise pA		Drift pA/Hr	
	0.05		0.01	
Agilent Recommended:	<=	0.10	<=	2.50
Status:	Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2: Back SSL / Back FID
Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD:		1.06 %	Retention Time RSD:		0.93 %
Agilent Recommended:	<=	3.00	<=	1.00	

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2: Back SSL / Back FID
Injection Tower
Name: 7890

Setpoint Status: Pass

Signal to Noise:		1771221
Agilent Recommended:	>=	300000

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC-6_CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CNCN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

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

Inlet 2

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

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

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Details

Full Name of Signer:	Saenguthai Tarak
Logged On User Name:	saenguthai.tarak@non.agilent.com
Signature Creation Date:	October 22, 2024
Reason for Signature:	Executed protocol and published this original version of document

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System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_GQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:16:06 PM	Audit	SessionCreated	Session	None
October 21, 2024 3:16:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 21, 2024 3:22:40 PM	Audit	EqpLoaded	Session	EQP details for primary technique (Gc) - File path: [ProtocolPacks\GcConfigurations\02.53\Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [Agilent\Recommended\Protocol Revision (Gc.02.53]
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:22:47 PM	Start	Qualification	Session	OQ
October 21, 2024 3:22:48 PM	Start	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	None
October 21, 2024 3:23:35 PM	End	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	Run Count : 1
October 21, 2024 3:23:45 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2024 3:23:59 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1

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2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:01 PM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:26 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:25:28 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:25:32 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:25:50 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:26:01 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:26:05 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:26:10 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:26:12 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

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System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:26:50 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:26:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:54 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:27:10 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:11 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:47 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:28:54 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:07 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:09 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:34 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:37 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:31:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:34:37 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2024 3:38:05 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2024 3:39:33 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2024 3:40:12 PM	Audit	AceClosed	Session	None
October 22, 2024 8:55:47 AM	Audit	AceRestarted	Session	None
October 22, 2024 8:55:59 AM	Audit	SessionRetrieved	Session	None
October 22, 2024 8:56:02 AM	Start	Qualification	Session	OQ

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System Id: GC-6_CN11461066
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2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:56:02 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:46 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Front\Front_SC10.D\FID1A.ch
October 22, 2024 8:57:25 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 8:57:39 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 8:58:03 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Front\Front_ND10.D\FID1A.ch
October 22, 2024 8:58:37 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2024 8:59:06 AM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over

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System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0105.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0106.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0107.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0108.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0109.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0110.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:02:34 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Front\Front_SN01.D\FID1A.ch

User Name: saengathai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV
System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:54 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID -L: >= 300000	Run Count : 1
October 22, 2024 9:03:00 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Back\Back_SC01.D\ FID2B.ch
October 22, 2024 9:04:03 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 9:04:06 AM	Start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 9:08:56 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Back\Back_ND013.D \FID2B.ch
October 22, 2024 9:09:13 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 9:09:26 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saengathai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV
System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0111.D \FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0112.D \FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0113.D \FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0114.D \FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0115.D \FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0116.D \FID2B.ch
October 22, 2024 9:11:15 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:11:23 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID -L: >= 300000	None
October 22, 2024 9:11:45 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID -L: >= 300000	Data files Path : G:\Data\Back\Back_SN01.D\ FID2B.ch

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Date: October 22, 2024 9:27:05 AM
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User Name: saengathai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV
System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID -L: >= 300000	Run Count : 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	OQ
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:09 AM	Audit	Reporting	Session	Report Generated : Certificate
October 22, 2024 9:25:56 AM	Audit	Reporting	Session	Report Generated : Report

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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CALIBRATION LABORATORY
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NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACC24057
Pages : 1 of 3

Calibration Certificate

Equipment :	SOUND CALIBRATOR
Manufacturer :	RION
Model :	NC-74
Serial No.:	34478386
ID No.:	SGK_FS0011

22-Oct-25

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 : 04 OCTOBER 2024
Calibration Date : 22 OCTOBER 2024
Date of Issue : 24 OCTOBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : (Thanakul Petchurai)

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

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CALIBRATION LABORATORY
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NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACC24057
Job No. : VC67AC0167
Pages : 2 of 3

Calibration Procedure : CP-AC-03

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

Condition of this result of calibration :
1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL.BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL.BP 20/0267	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL.BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V744I86069	EF-0009-24	09-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACC24057
Job No. : VC67AC0167
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.14	0.14	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1002.6	0.3	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.47	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 lavel of confidence of approximately 95 %

End of Calibration Certificate

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Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00331094 / 22922 / 22569
ID No.: SGK_FS0131

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) %

REVIEWED BY Nonakorn P
APPROVED BY
NOMINAL DATE 17/6/24

Received Date : 06 JUNE 2024
Calibration Date : 17 JUNE 2024
Date of Issue : 18 JUNE 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petch.
(Thanakul Petchurai)

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Calibration Procedure : CP-AC-01

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

Condition of this result of calibration :
1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petch.

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Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Summary of Measurement Result :

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

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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise
2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.6
Flat	20.3

3. Acoustical signal tests of frequency weightings
Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.0
1000	0.0	0.0	0.0	± 0.7
8000	-0.1	0.0	0.0	+ 1.5, - 2.5

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4. Electrical signal tests of frequency weightings
Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz
5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

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Tel. +66 2433 8331 Email : calibration@sithiphorn.com

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

T. Petch.

Cert. No. : ACL24182
Job No. : VC67AC0104
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

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	±2.0
One	136.4	135.5	-0.9	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

Cert. No. : ACL24182
Job No. : VC67AC0104
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

Certificate of Calibration

Customer

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

Certificate No : 25-SLM-031
Request No : Req-2025-0190

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NL-52A
Serial Number : 01120940
ID : SGK_FS0127
Resolution : 0.1 dB

Microphone Class : 1
Microphone Model : UC-59
Microphone S/N : 21942
Preamplifier Model : NH-25
Preamplifier S/N : 22229
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 24 January 2025
Calibrated Date : 6 February 2025
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

09/ 02/ 2026

Reference Standard

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

Note

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

Calibrated By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Muthuvorn
Calibration Engineer Supervisor

Issue Date : 6 February 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

Certificate No : 25-SLM-031
Request No : Req-2025-0190

1. Indication at the calibration check frequency

UUC Setting / Calibrator Setting	Nominal Level (dB)	Before Adjust UUC (dB)	Before Adjust ERR (dB)	After Adjust UUC (dB)	After Adjust ERR (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130								
1000 Hz 114 dB	113.76	113.7	-0.06	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting FAST / 30-130 UUC Weighting	Measured (dB)	UNCERTAINTY (± dB)
A	14.2	0.10

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

UUC Setting FAST / 30-130 UUC Weighting	Measured (dB)	UNCERTAINTY (± dB)
A	10.1	0.10
C	13.3	0.10
Z	16.9	0.10

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

UUC Setting FAST / 30-130 STD Setting	Deviation from various Frequency Weighting Response curve A (dB)	C (dB)	Z (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
12.5 Hz	0.1	0.3	0.3	0.60	1.0	Pass
1000 Hz	0.0	0.0	0.0	0.60	0.7	Pass
4000 Hz	0.4	0.4	0.3	0.60	1.0	Pass1
8000 Hz	0.4	0.4	0.3	0.70	+1.5 -2.5	Pass

Certificate No : 25-SLM-031
Request No : Req-2025-0190

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

UUC Setting FAST / 30-130 STD Setting	Deviation from various Frequency Weighting Response curve A (dB)	C (dB)	Z (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
63 Hz	-0.2	-0.1	-0.1	0.20	1.0	Pass
125 Hz	-0.1	0.0	0.0		1.0	Pass
250 Hz	-0.1	0.0	0.0		1.0	Pass
500 Hz	-0.1	0.0	0.0		1.0	Pass
1000 Hz	0.0	0.0	0.0		0.7	Pass
2000 Hz	0.0	0.0	0.0		1.0	Pass
4000 Hz	0.0	0.0	0.0		1.0	Pass
8000 Hz	0.0	0.0	0.0		+1.5, -2.5	Pass
16000 Hz	-1.4	-1.4	0.0		+2.5, -16.0	Pass

6. Frequency and time weightings at 1kHz

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

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

Certificate No : 25-SLM-031
Request No : Req-2025-0190

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting FAST / A / 30-130 STD dB	Anticipated REF (dB)	Deviation UUC (dB)	Deviation ERR (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
138.00	138	138.0	0.0	0.30	0.8	Pass
134.00	134	134.0	0.0		0.8	Pass
129.00	129	129.0	0.0		0.8	Pass
124.00	124	124.0	0.0		0.8	Pass
119.00	119	119.0	0.0		0.8	Pass
114.00	114	114.0	0.0		0.8	Pass
109.00	109	109.0	0.0		0.8	Pass
104.00	104	104.0	0.0		0.8	Pass
99.00	99	99.0	0.0		0.8	Pass
94.00	94	94.0	0.0		0.8	Pass
89.00	89	89.0	0.0		0.8	Pass
84.00	84	84.0	0.0		0.8	Pass
79.00	79	79.0	0.0		0.8	Pass
74.00	74	74.0	0.0		0.8	Pass
69.00	69	69.0	0.0		0.8	Pass
64.00	64	64.0	0.0		0.8	Pass
59.00	59	59.0	0.0		0.8	Pass
54.00	54	54.0	0.0		0.8	Pass
49.00	49	49.0	0.0		0.8	Pass
44.00	44	44.0	0.0		0.8	Pass
39.00	39	39.0	0.0		0.8	Pass
34.00	34	34.1	0.1		0.8	Pass
29.00	29	29.1	0.1		0.8	Pass
24.00	24	24.2	0.2		0.8	Pass

Certificate No : 25-SLM-031
Request No : Req-2025-0190

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UUC	ERR			
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)	
30-130	29.50	29.5	0.0	0.30	0.8	Pass
	114	114.0	0.0		0.8	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
A / 30-130	Tone burst	Ref	UUC	ERR			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	126.0	126.0	0.0	0.20	0.5	Pass
	2	109.0	108.9	-0.1		+1.0, -1.5	Pass
	0.25	100.0	99.9	-0.1		+1.0, -3.0	Pass
Slow	200	119.6	119.5	-0.1		0.5	Pass
	2	100.0	99.9	-0.1		+1.0, -3.0	Pass
SEL	200	120.0	120.0	0.0		0.5	Pass
	2	100.0	100.0	0.0		+1.0, -1.5	Pass
	0.25	91.0	90.8	-0.2		+1.0, -3.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / C / 55-141	REF	UUC	ERR			
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	136.4	136.3	-0.10	0.20	2.0	Pass
Positive half cycle	135.4	135.1	-0.30		1.0	Pass
Negative half cycle	135.4	135.1	-0.30		1.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

Certificate No : 25-SLM-031
Request No : Req-2025-0190

12. Overload indication

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

13. High Level Stability

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

Note :

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

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

Certificate No : 25-SLM-031
Request No : Req-2025-0190

Decision Rule for Statements of Conformity

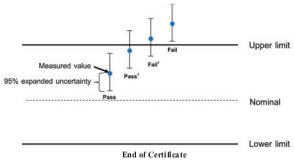
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass[1] = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail[1] = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

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CALIBRATION LABORATORY
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Cert. No. : ACL24183
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00331095 / 22927 / 22570
ID No.: SGK_FS0132

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 BY Nathakorn P 17/6/24
APPROVED BY 17/6/24
ISSUED BY 17/6/24

Received Date : 06 JUNE 2024
Calibration Date : 17 JUNE 2024
Date of Issue : 18 JUNE 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchurai
(Thanakul Petchurai)

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

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Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Cert. No. : ACL24183
Job No. : VC67AC0104
Pages : 2 of 8

Calibration Procedure : CP-AC-01

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

Condition of this result of calibration :
1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchurai

SITHIPORN ASSOCIATES CO., LTD.
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Cert. No. : ACL24183
Job No. : VC67AC0104
Pages : 3 of 8

Summary of Measurement Result :

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

T. Petchurai

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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.1

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

Frequency Weighting	Measured value (dB)
A - weight	8.7
C - weight	14.2
Flat	19.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.0
1000	0.0	0.0	0.0	± 0.7
8000	0.6	0.7	0.6	+ 1.5, - 2.5

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	43.9	-0.1	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

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	±2.0
One	136.4	135.8	-0.6	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

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11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
71/39 MOO 13, SOI SUNTHAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL.: 0609-2116-5800-1 FAX: 0609-2116-7140

Certificate of Calibration

Customer

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

Certificate No : 25-AFM-014
Request No : Req-2025-0049

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Ibios
Model : Defender 510-L
Serial Number : 206895
ID : BKK_FS1346
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 8 January 2025
Calibration Date : 15 January 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY
APPROVED BY
NEXT CAL DATE: 15/01/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000657	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU651882	TPA	21 October 2025

Traceability :

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

Note :

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

Calibration By : Mr. Noppadon Luangart, Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn, Calibration Engineer Supervisor

Issue Date : 15 January 2025

The results related only to the item calibrated, The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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TEL: 06610-2116-5860-1 FAX: 06610-2116-7140

Certificate No : 25-AFM-014

Request No : Req-2025-0049

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.70	101.13	20	20.137	0.1	1.3	0.2	Pass1
23.00	101.13	50	50.328	0.3	3.3	0.5	Pass1
23.00	101.13	101	100.64	-0.4	2.8	1.0	Pass1
22.80	101.13	151	150.06	-0.9	4.2	1.5	Pass1
22.80	101.15	201	200.11	-0.9	5.6	2.0	Pass1
23.00	101.17	300	300.04	0.0	8.4	3.0	Pass1
22.90	101.18	399	400.00	1.0	11	4.0	Pass1
23.00	101.19	498	500.10	2.1	7.3	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration

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

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

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

* Indicates non accredited

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

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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TEL: 06610-2116-5860-1 FAX: 06610-2116-7140

Certificate No : 25-AFM-014

Request No : Req-2025-0049

Decision Rule for Statements of Conformity

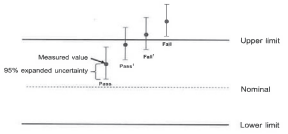
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass^1 = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail^1 = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

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TEL: 06610-2116-5860-1 FAX: 06610-2116-7140

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

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

Certificate No : 25-AFM-015

Request No : Req-2025-0048

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Bios Accuracy : 1% of Reading

Model : Defender 510-H Sensor Model : -

Serial Number : 207355 Sensor Serial Number : -

ID : BKK_FS1348 Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 8 January 2025

Calibration Date : 15 January 2025

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

Nantana P.

15/01/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18301010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT11	08000057	Qutlorm	1 March 2025
Pressure meter	CPG2400	41000KDU651882	TPA	21 October 2025

Traceability :

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

Note :

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

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavom
Calibration Engineer Supervisor

Issue Date : 15 January 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

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TEL: 06610-2116-5860-1 FAX: 06610-2116-7140

Certificate No : 25-AFM-015

Request No : Req-2025-0048

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.30	101.36	303	301.53	-1.5	8.4	3	Pass1
22.70	101.35	1004	1002.9	-1	15	10	Pass1
23.00	101.38	5013	5000.7	-12	72	50	Pass1
22.00	101.50	9999	10004	15	140	100	Pass1
22.00	101.54	14957	14996	39	220	150	Pass1
23.60	101.94	20226	20066	-160	310	201	Pass1
24.00	102.20	25161	25110	-51	360	251	Pass1
24.20	102.50	30020	30005	-15	430	300	Pass1

Note STD : Standard UUC : Unit Under Calibration

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

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

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
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TEL: 06610-2116-5860-1 FAX: 06610-2116-7140

Certificate No : 25-AFM-015

Request No : Req-2025-0048

Decision Rule for Statements of Conformity

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

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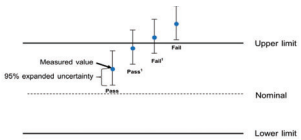

End of Certificate

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Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : scalibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 13-Jan-2025

Certificate No. : 25MA0126

CSR No. : A101/05028

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Customer Laboratory

Instrument Name : Analytical Balance

Manufacturer : Sartorius

Model : MCE125P-2S00-U

Serial No. : 0038105237

ID No. : SGK_CL0077

Resolution : 0.00001 g / 0.0001 g

Received Date : 10-Jan-2025

Calibrated Date : 10-Jan-2025

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 20) %

REVIEW BY ..... Ananta B.
APPROVED BY ..... Kanitha H.
NEXT CAL. DATE 10/1/26

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.001 based on UKAS LAB 14 : 2015

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- SCaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Hadboordee Dettawee

Approved by : Imron Rattanaylum / Technical Manager

The uncertaintics are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

SCaL

Certificate No. : 25MA0126
CSR No. : A101/05028
Page. : 2 of 3

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Weight Set	2 mg - 1 kg	11119514/01	24SWS001	3-Jul-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Repeatability

Nominal Value (g)	Standard Deviation (g)
5	0.00000
50	0.00000
100	0.0000

2. Effect of tare

Nominal Value (g)	Standard Value (g)	Balance Reading (g)	Correction (g)
10	10.00004	10.00000	0.00004
20	20.00000	20.00000	0.00000
30	30.00005	30.00000	0.00005
40	40.00006	40.00000	0.00006
50	50.00000	50.00000	0.00000

SCaL

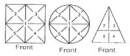
Certificate No. : 25MA0126
CSR No. : A101/05028
Page. : 3 of 3

Result of Calibration :.

3. Off-centre loading

A mass approximately 50g was placed on a pan and moved to various position .
The balance reading obtained are given in the table.

Position					Maximum Difference (g)
1	2	3	4	5	
50.00000	50.00000	50.00000	50.00000	50.00000	0.00000



4. Departure from nominal value

Nominal Value (g)	Standard Value (g)	UUC Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor (k)
0.01	0.01001	0.01000	0.00001	0.000024	2.0
0.05	0.05001	0.05000	0.00001	0.000024	2.0
0.1	0.10002	0.10000	0.00002	0.000024	2.0
0.5	0.50002	0.50000	0.00002	0.000024	2.0
1	1.00003	1.00000	0.00003	0.000024	2.0
2	2.00003	2.00000	0.00003	0.000024	2.0
5	5.00003	5.00000	0.00003	0.000027	2.0
10	10.00004	10.00000	0.00004	0.000033	2.0
20	20.00000	20.00000	0.00000	0.000048	2.0
30	30.00005	30.00000	0.00005	0.000078	2.0
40	40.00006	40.00000	0.00006	0.000080	2.0
50	50.00000	50.00000	0.00000	0.000096	2.0
60	60.0000	60.0000	0.0000	0.00011	2.0
70	70.0000	70.0000	0.0000	0.00012	2.0
80	80.0000	80.0000	0.0000	0.00014	2.0
90	90.0001	90.0000	0.0001	0.00015	2.0
100	100.0000	100.0000	0.0000	0.00017	2.0
110	110.0000	110.0000	0.0000	0.00024	2.0
120	120.0000	120.0000	0.0000	0.00024	2.0

- UUC = Unit Under Calibration

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

...End...

JNAC
JRANATEE ASSOCIATES CO.,LTD

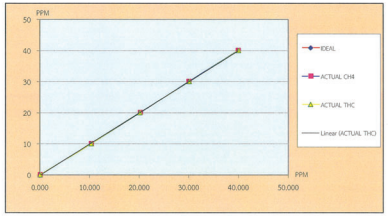
REVIEW BY Vichuda N.
APPROVED BY Jamyatorn M.
NEXT CAL. DATE 11/6/25

TEST REPORT

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด)				
EQRIPMENT NAME	: THC Analyzer				
MANUFACTURER	: HORIBA	MODEL	: APHA-370	SERIAL NO	: WKJ0N59M
STANDARD GAS CONCENTRATION (PPM)	: 506.1 PPM			CYLINDER NO	: CC734373
CYLINDER PRESSURE (psig)	: 1,000 PSI			CERTIFIED DATE	: 12/05/2020
CERTIFIED BY	: AIRGAS			EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH4	ERROR CH4	%ERROR CH4	ACTUAL THC	ERROR THC	%ERROR THC
ZERO	0.000	0.00	0.000	-	0.00	0.000	-
1	10.000	10.30	0.300	3.00	10.29	0.290	2.90
2	20.000	20.20	0.200	1.00	20.09	0.090	0.45
3	30.000	30.01	0.010	0.03	30.10	0.100	0.33
4	40.000	39.90	-0.100	-0.25	39.99	-0.010	-0.02
AVERAGE (%)				0.95			0.91



CALIBRATED BY : ... DATE : 11/8/66
CHECKED BY : ... DATE : 14/8/66

ที่อยู่การติดต่อทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15,16 , E-Mail : Engineer@jranatee.com
เลขที่ 63/14-15,67/35-36 ถนนพระรามที่ 7,7/1 แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-8680812-13 โทรสาร 02-868-1889

FO-EN-206 R01/22-10-14

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
453-455(1) Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

SITHIPORN associates
ISO/IEC 17025 NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL24300
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472128 / 170311 / 73011
ID No.: SGK_FS0013

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) %

REVIEW BY Nipakarn P.
APPROVED BY
NEXT CAL. DATE 1/10/25

Received Date : 11 SEPTEMBER 2024
Calibration Date : 01-02 OCTOBER 2024
Date of Issue : 02 OCTOBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchu
(Thanakul Petchurai)

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

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
453-455(1) Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

SITHIPORN associates
ISO/IEC 17025 NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL24300
Job No. : VC67AC0157
Pages : 2 of 8

Calibration Procedure : CP-AC-01

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

Condition of this result of calibration :
1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petch.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
453-455(1) Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

SITHIPORN associates
ISO/IEC 17025 NSC-TISI-TIS 17025 CALIBRATION 0394

Cert. No. : ACL24300
Job No. : VC67AC0157
Pages : 3 of 8

Summary of Measurement Result :

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

T. Petch.

Cert. No. : ACL24300
Job No. : VC67AC0157
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
20.3

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

Frequency Weighting	Weighting (dB)
A - weight	13.4
C - weight	19.5
Flat	25.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.2	-0.2	-0.2	± 1.5
1000	-0.3	-0.3	-0.3	± 1.0
8000	0.0	0.1	0.1	±5.0

Cert. No. : ACL24300
Job No. : VC67AC0157
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Cert. No. : ACL24300
Job No. : VC67AC0157
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	79.0	0.0	± 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	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.2	0.2	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

Cert. No. : ACL24300
Job No. : VC67AC0157
Pages : 7 of 8

8. Level linearity including the level range control

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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	30.0	29.9	-0.1	±1.1

9. Tone burst response

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

Cert. No. : ACL24300
Job No. : VC67AC0157
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

11. Overload indication

Measured value (dB)		Deviated	Acceptance
Positive one-half cycle	Negative one-half cycle	Value (dB)	Limits (dB)
89.6	89.7	0.1	±1.5

12. High level stability

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

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

End of Calibration Certificate

Cert. No. : ACL25013
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00672670 / 170413 / 72911
ID No.: SGK_FS0023

Condition As Found : GOOD

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

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

Received Date : 19 DECEMBER 2024
Calibration Date : 09 - 10 JANUARY 2025
Date of Issue : 13 JANUARY 2025

09/ 01/ 26

Calibrated by : Nathakorn Pisutpaisan

Approved by : (Thanakul Petchurai)

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

Cert. No. : ACL25013
Job No. : VC68AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL25013
Job No. : VC68AC0053
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL25013
Job No. : VC68AC0053
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.7

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

Frequency Weighting	Weighting (dB)
A - weight	12.6
C - weight	18.9
Flat	24.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.7	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.8	-1.7	-1.7	±5.0

Cert. No. : ACL25013
Job No. : VC68AC0053
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Cert. No. : ACL25013
Job No. : VC68AC0053
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.2	0.2	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

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8. Level linearity including the level range control

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

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

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CALIBRATION LABORATORY

Cert. No. : ACL25013
Job No. : VC68AC0053
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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	132.9	-0.1	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **13 February 2025** CERTIFICATE NUMBER **232862**

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

Approved signatory
R.Thomas
Electronically signed:

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc
Model: RC:110A
Serial number: 98651
Class: 2

Notes:

Test summary

Date of calibration: 13 February 2025

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency-(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

12/ 02/ 2026

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 101.80 kPa Temperature: 22.1 °C Humidity: 31.5 %
After Pressure: 101.80 kPa Temperature: 22.4 °C Humidity: 32.2 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1063074
Environmental Monitor	Comet	T7510	21962628

Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.06	114.05	114.06	**114.06**	0.06	±0.75	0.11 dB
Distortion (%)	< 4.00	0.70	0.71	0.74	**0.72**	0.72	+4.00	0.13 %
Frequency (Hz)	1000.0	996.7	996.6	996.7	**996.7**	-3.3	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Functionality Results

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

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **13 February 2025** CERTIFICATE NUMBER **232792**

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

Approved signatory
R.Thomas
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB1501
Firmware version: 5.4

Notes:

Test summary

Date of calibration: 07 February 2025

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6307
Attenuator	Cirrus Research	ZE:952	78135
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	UNIDB4A	92610

Notes

06/ 02/ 2026

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 102.27 kPa Temperature: 21.4 °C Humidity: 37.2 %
After Pressure: 102.24 kPa Temperature: 21.4 °C Humidity: 40.2 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

CERTIFICATE OF CALIBRATION

Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

B1: Absolute Acoustical Sensitivity

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	114.60	-0.6	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Responce To Steady Signals

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB **Range:** 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Duration (s)	Deviation (Pa²h)	Limits (Pa²h)	Deviation (%)	Limits (%)
80	0.000222	0.000267	20	-0.000045	0.000175 / 0.000280	20	-21 / +26
90	0.002222	0.002074	20	0.000148	0.001755 / 0.002800	-7	-21 / +26
100	0.022222	0.020267	20	0.001955	0.017555 / 0.028000	-9	-21 / +26
110	0.222222	0.202669	20	0.019553	0.175555 / 0.280000	-9	-21 / +26
120	2.222222	2.073898	20	0.148324	1.755555 / 2.800000	-7	-21 / +26
130	22.222223	21.716383	20	0.505840	17.555556 / 28.000001	-2	-21 / +26

B3: Frequency Weightings

Result: Passed

Reference Frequency: 1000 Hz **Reference Exposure:** 5.1970572512568

Reference Input Level: 127 dB **Duration:** 10 Seconds

Frequency (Hz)	Exposure (Pa²h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.111111	0.0214	0.0174 / 0.0347	0.15
8000	2.021890	0.389	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: Passed

Uncertainty: 0.2 dB **Frequency:** 4000 Hz

Input Level (dB)	Burst Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003434	0.003279	-5	-21 / +26
129	100	1:1000	10	1	999	0.010858	0.011906	10	-29 / +41

B6: Latching Overload Indicator

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **13 February 2025** CERTIFICATE NUMBER **232789**

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

Approved signatory
R.Thomas
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes:
Model: CR:110A
Serial number: CB1546
Firmware version: 5.4

Test summary

Date of calibration: 07 February 2025

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing sucessfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDC7R0237
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79920

Notes

06/ 02/ 2026

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 102.27 kPa Temperature: 21.4 °C Humidity: 39.2 %
After Pressure: 102.24 kPa Temperature: 21.4 °C Humidity: 40.3 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

B1: Absolute Acoustical Sensitivity

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	114.70	-0.7	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Responce To Steady Signals

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB **Range:** 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Duration (s)	Deviation (Pa²h)	Limits (Pa²h)	Deviation (%)	Limits (%)
80	0.000222	0.000249	20	-0.000027	0.000175 / 0.000280	12	-21 / +26
90	0.002222	0.001935	20	0.000287	0.001755 / 0.002800	-13	-21 / +26
100	0.022222	0.020267	20	0.001955	0.017555 / 0.028000	-9	-21 / +26
110	0.222222	0.198056	20	0.024166	0.175555 / 0.280000	-11	-21 / +26
120	2.222222	2.073898	20	0.148324	1.755555 / 2.800000	-7	-21 / +26
130	22.222223	21.222058	20	1.000165	17.555556 / 28.000001	-5	-21 / +26

B3: Frequency Weightings

Result: Passed

Reference Frequency: 1000 Hz **Reference Exposure:** 5.1970572512568

Reference Input Level: 127 dB **Duration:** 10 Seconds

Frequency (Hz)	Exposure (Pa²h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.111111	0.0214	0.0174 / 0.0347	0.15
8000	2.021890	0.389	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: Passed

Uncertainty: 0.2 dB **Frequency:** 4000 Hz

Input Level (dB)	Burst Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003514	0.004034	15	-21 / +26
129	100	1:1000	10	1	999	0.011111	0.010611	-5	-29 / +41

B6: Latching Overload Indicator

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **13 February 2025** CERTIFICATE NUMBER **232794**

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

Approved signatory
R.Thomas
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes:
Model: CR:110A
Serial number: CB1547
Firmware version: 5.4

Test summary

Date of calibration: 07 February 2025

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing sucessfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6307
Attenuator	Cirrus Research	ZE:952	78135
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	UNIDB4A	92610

Notes

06/ 02/ 2026

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 102.31 kPa Temperature: 21.3 °C Humidity: 38.2 %
After Pressure: 102.28 kPa Temperature: 21.3 °C Humidity: 37.2 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

B1: Absolute Acoustical Sensitivity

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	114.80	-0.8	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Responce To Steady Signals

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB **Range:** 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Duration (s)	Deviation (Pa²h)	Limits (Pa²h)	Deviation (%)	Limits (%)
80	0.000222	0.000267	20	-0.000045	0.000175 / 0.000280	20	-21 / +26
90	0.002222	0.002122	20	0.000100	0.001755 / 0.002800	-5	-21 / +26
100	0.022222	0.021222	20	0.001000	0.017555 / 0.028000	-5	-21 / +26
110	0.222222	0.207390	20	0.014832	0.175555 / 0.280000	-7	-21 / +26
120	2.222222	2.122206	20	0.100016	1.755555 / 2.800000	-5	-21 / +26
130	22.222223	22.739845	20	-0.517622	17.555556 / 28.000001	2	-21 / +26

B3: Frequency Weightings

Result: Passed

Reference Frequency: 1000 Hz **Reference Exposure:** 5.1970572512568
Reference Input Level: 127 dB **Duration:** 10 Seconds

Frequency (Hz)	Exposure (Pa²h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.111111	0.0214	0.0174 / 0.0347	0.15
8000	2.166494	0.4169	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: Passed

Uncertainty: 0.2 dB **Frequency:** 4000 Hz

Input Level (dB)	Burst Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa²h)	Exposure (Pa²h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003434	0.003356	-2	-21 / +26
129	100	1:1000	10	1	999	0.010858	0.010858	0	-29 / +41

B6: Latching Overload Indicator

Result: Passed

Frequency: 1000 Hz **Uncertainty:** 0.2 dB

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **12 June 2024** CERTIFICATE NUMBER **216165**

REVIEW BY Nmahom P
APPROVED BY
NEXT CAL. DATE 12/6/25

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

Approved signatory
N.Smith
Electronically signed:

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc **Notes:**
Model: RC:110A
Serial number: 79623
Class: 2

Test summary

Date of calibration: 12 June 2024

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 101.19 kPa Temperature: 22.2 °C Humidity: 44.2 %
After Pressure: 101.19 kPa Temperature: 22.2 °C Humidity: 43.6 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1053426
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Environmental Monitor	Comet	T7510	21962628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.95	113.93	113.93	**113.94**	-0.06	±0.75	0.11 dB
Distortion (%)	< 4.00	0.28	0.28	0.28	**0.28**	0.28	+4.00	0.13 %
Frequency (Hz)	1000.0	998.6	998.6	998.5	**998.5**	-1.5	±200.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.98	113.99	113.99	**113.99**	-0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.28	0.28	0.28	**0.28**	0.28	+4.00	0.13 %
Frequency (Hz)	1000.0	998.5	998.5	998.5	**998.5**	-1.5	±200.0	0.1 Hz

Functionality Results

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

End of results

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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Acoustic calibration laboratory
Calibration services department.

REVIEW BY Nmahom P
APPROVED BY
NEXT CAL. DATE 29/9/25

Calibration report Number
CDM-148-67

CALIBRATION REPORT

MEASUREMENT ITEM	: Dose meter
MANUFACTURER	: Cirrus Research plc
MODEL/TYPE	: CR:110AIS
SERIAL NUMBER	: YG266
ID NUMBER	: SGK_FS0057
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 27 Sep 2024
MEASUREMENT DATE	: 27 Sep 2024
ISSUE DATE	: 30 Sep 2024

Calibration procedure:
The Noise dosimeter (Unit Under Calibration) was calibrated against Standard doseBadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Traceability:
This certificate provides a traceability of The measurement to recognized the national (Standard) and to realization of the International System of units (SI) through Cirrus research plc via Certificate number: 218610

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

STANDARD USED DURING CALIBRATION:
Instrument name: doseBadge Reader **Manufacturer:** Cirrus Research plc. **Model:** RC:110A **Serial number:** 81051
Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:
Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level[1] (dB)	Noise Dosimeter reading[2] (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:
☐ Mr. Sorawit Thachalad
☑ Miss Jittraporn Lertsomphol
☐ Miss Rungrumpai Phoommit

JNAC JIRANATEE ASSOCIATES CO.,LTD.

Approved signatory:
Mr. Pornpa Roncharoen
Calibration Department Manager

Remark:
[1] The dose level of standard doseBadge reader that supplied to Unit Under Calibration.
[2] The measurement reading of Unit Under Calibration.

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

JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
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NSC-TISI-TIS 17025
CALIBRATION 0367

Temperature measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-157-67

MEASUREMENT ITEM	: Heat Stress Monitor
MANUFACTURER	: Delta OHM
MODEL/TYPE	: HD32.2
SERIAL NUMBER	: 22016402
ID NUMBER	: SGK_F50103
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 09 Aug 2024
MEASUREMENT DATE	: 23 Aug 2024
ISSUE DATE	: 26 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

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

REVIEW BY
APPROVED BY
NEXT CAL. DATE 23/6/25

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

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

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

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol
☑ Miss Ruangrumpai Phoommit

Approved signatory: .....
Mr. Parinya Booncharoen
Calibration Department Manager

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 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025592.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.058	19.9	-0.2	0.099
80	25.047	24.9	-0.1	0.099
80	30.039	29.9	-0.1	0.099
80	35.033	34.9	-0.1	0.099
80	40.025	39.8	-0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023949.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.058	20.1	0.0	0.099
110	25.046	25.1	0.1	0.099
110	30.039	30.1	0.1	0.099
110	35.033	35.1	0.1	0.099
110	40.025	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025046.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.1	0.0	0.099
75	25.046	25.0	0.0	0.099
75	30.039	30.0	0.0	0.099
75	35.033	34.9	-0.1	0.099
75	40.024	39.9	-0.1	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

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Jiranatee Associates Co.,Ltd
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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Temperature measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-158-67

MEASUREMENT ITEM	: Heat Stress Monitor
MANUFACTURER	: Delta OHM
MODEL/TYPE	: HD32.2
SERIAL NUMBER	: 22016403
ID NUMBER	: SGK_F50104
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 09 Aug 2024
MEASUREMENT DATE	: 23 Aug 2024
ISSUE DATE	: 26 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

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

REVIEW BY
APPROVED BY
NEXT CAL. DATE 26/5/25

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

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

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

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol
☑ Miss Ruangrumpai Phoommit

Approved signatory: .....
Mr. Parinya Booncharoen
Calibration Department Manager

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JIRANATEE ASSOCIATES CO.,LTD.

Result of Calibration: ☑ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025585.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.058	20.0	-0.1	0.099
80	25.046	25.0	0.0	0.099
80	30.038	30.0	0.0	0.099
80	35.034	35.0	0.0	0.099
80	40.024	39.9	-0.1	0.16

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023950.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.058	20.1	0.0	0.099
110	25.047	25.1	0.1	0.099
110	30.038	30.0	0.0	0.099
110	35.033	35.0	0.0	0.099
110	40.024	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025056.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.058	20.1	0.0	0.099
75	25.047	25.0	0.0	0.099
75	30.038	29.9	-0.1	0.099
75	35.033	34.8	-0.2	0.099
75	40.024	39.7	-0.3	0.099

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

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

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Jiranatee Associates Co.,Ltd
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NSC-TISI-TIS 17025
CALIBRATION 0367

Temperature measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-208-67

MEASUREMENT ITEM	: Heat Stress Monitor
MANUFACTURER	: Delta OHM
MODEL/TYPE	: HD32.2
SERIAL NUMBER	: 18006678
ID NUMBER	: SGK_F50043
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 25 Nov 2024
MEASUREMENT DATE	: 02 Dec 2024
ISSUE DATE	: 02 Dec 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

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

2- Dec-25

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

Traceability:
The measurement results are traceable to the International system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: ER-0113-24

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09, Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A ME II, Serial No.: 671407-00591 Due date: 21 Oct 2025

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol
☑ Miss Ruangrumpai Phoommit

Approved signatory: .....
Mr. Parinya Booncharoen
Calibration Department Manager

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

JIRANATEE ASSOCIATES CO.,LTD.

Result of Calibration: ☑ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 18007970.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.050	20.0	-0.1	0.099
80	25.056	25.0	-0.1	0.099
80	30.048	29.9	-0.1	0.16
80	35.041	34.9	-0.1	0.099
80	40.033	39.9	-0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2, S/N: 18008102.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.050	20.0	0.0	0.099
110	25.056	25.0	-0.1	0.099
110	30.048	30.0	0.0	0.099
110	35.041	35.0	0.0	0.099
110	40.032	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 18007688.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.050	20.1	0.1	0.099
75	25.056	25.0	-0.1	0.099
75	30.048	29.9	-0.1	0.099
75	35.041	34.9	-0.1	0.099
75	40.033	39.9	-0.1	0.099

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

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

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CALIBRATION 0367

Temperature measurement laboratory
Calibration services department.

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CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-161-67

MEASUREMENT ITEM	: Heat Stress Monitor
MANUFACTURER	: Delta OHM
MODEL/TYPE	: HD32.2
SERIAL NUMBER	: 22016406
ID NUMBER	: SGK_FS0107
CONDITION AS-RECEIVED	: Used Item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 09 Aug 2024
MEASUREMENT DATE	: 26 Aug 2024
ISSUE DATE	: 26 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

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

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

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

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 26/8/25

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

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

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

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Ittiraporn Lertsomphol
☑ Miss Ruangrumpai Phoommit

JNAC JIRANATEE ASSOCIATES CO.,LTD.

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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Jiranatee Associates Co.,Ltd.

JNAC
JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number CDT-161-67

Result of Calibration: ☑ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025591. Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.047	20.0	0.0	0.099
80	25.053	24.9	-0.2	0.099
80	30.046	29.9	-0.1	0.099
80	35.037	34.9	-0.1	0.099
80	40.022	39.9	-0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023948. Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.047	20.0	0.0	0.099
110	25.053	25.0	-0.1	0.099
110	30.045	30.0	0.0	0.099
110	35.037	35.0	0.0	0.099
110	40.022	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025047. Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.047	20.1	0.1	0.099
75	25.053	25.0	-0.1	0.099
75	30.045	29.9	-0.1	0.099
75	35.037	34.8	-0.2	0.099
75	40.022	39.7	-0.3	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration

JNAC JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025 CALIBRATION 0008

Certificate of Calibration

Certificate No. : 24PH439

Equipment :	Lux Meter
Manufacturer:	Delta OHM
Model :	HD 2102.2
Serial No.:	17020596
ID No.:	SGK_FS0020
Condition As-Received:	Used Item
Received Date:	19 August 2024
Calibration Date:	26 August 2024
Reference:	2408-0589WSC
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 15) %

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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

Procedure used: Calibration were conducted using calibration procedure No. CP-PH01 based on inverse square law technique.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Photometry & Encorder	LMguide 9,6 m	120RC003	DL-0064-22	20 Jul 2025
2) High-accuracy Irradiance Standard	OL-FEL-U	F-1471	TP-1048-23	01 Oct 2024

2.This result of calibration was made on requested at the point specified by customer.
3.Test Equipment : Programmable Voltage/Current Source (Model : OL83A, S/N : 09220284).
4.Test Equipment : Illuminance Meter (Model : 51002, S/N : 080129).
5.The certificate is valid only to the item calibrated on date and place of calibration.
6.This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

REVIEW BY Nanakorn P.
APPROVED BY
NEXT CAL. DATE 24/8/26

Calibrated by : Nivat Nitas
Issue Date : 27 August 2024

Approved Signatory :
[ ] Phalinee Prabpaipal
[ ] Chatchawan Khunpiluek
[√] Nuntawat Khamchai

Result of calibration:- (*) Without adjustment ( ) After adjustment
Function : Illuminance Measurement **Range :** Autorange

Standard Value (lx)	UUC* Reading (lx)	Error (lx)	Uncertainty (± lx)
0	0.00	0.00	-
15	14.33	-0.67	0.22
100	95.14	-4.86	1.5
500	483.6	-16.4	7.1
1000	979.2	-20.8	15
2000	1994.3	-5.7	29
3000	3033	33	43
4000	4099	99	58
5000	5164	164	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 %

Calibration with probe s/n. 23002639
UUC* = Unit Under Calibration.

-o0o-

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

NSC-TISI-TIS17025 CALIBRATION 0284

CARIBRATION CERTIFICATE

Issued Date : 13-Jan-2025

Certificate No. : 25TH0226
CSR No. : A101/05028
Page. : 1 of 3

Customer	:	ALS Laboratory Group (Thailand) Co., Ltd 114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru, Amphoe Hat Yai, Songkhla, 90250
Calibration Place	:	Customer Laboratory
Instrument Name	:	Incubator
Manufacturer	:	Memmert
Model	:	ICP750
Serial No.	:	F816.0063
ID No.	:	SGK_CL0028
Resolution	:	0.1 °C
Received Date	:	10-Jan-2025
Calibrated Date	:	10-Jan-2025
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY Anorita B.
APPROVED BY Hanidia H.
NEXT CAL. DATE 10/1/26

Calibration Method Used :
This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrohim Saleemin

Approved by :
Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

SCaL

Certificate No. : 25TH0226
CSR No. : A101/05028

Details of Calibration

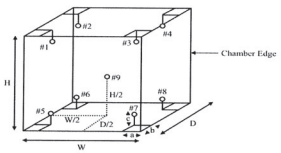
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisition/Switch Unit	34970A	MY58009813	PSL-T0707-1/67	22-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5.0 cm	W =	104.0 cm
b =	5.0 cm	H =	120.0 cm
c =	5.0 cm	D =	60.0 cm

SCaL

Certificate No. : 25TH0226
CSR No. : A101/05028
Page. : 3 of 3

Result of Calibration :-

2. Temperature Measurement Accuracy Test

The measurement results of the Incubator and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
20	20.03	20.23	20.37	20.34	20.32	20.03	20.19	20.31	20.06	0.38

3. Performance Result

The performance of the Incubator are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20	20.0	20.0	0.10	0.31	0.40

- UUC = Unit Under Calibration

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

... End ...

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

Certificate of Testing

Cert.No.: 24TW96
Page.: 1 of 2

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000
Serial No. :	17B101473
ID No. :	SGK_CL0073
Received Date :	17 May 2024
Test Date :	21 May 2024
Reference :	2405-0608DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean
Approved by :	Approved Signatory

REVIEW BY Ananta B
APPROVED BY Kanitta H
NEXT CAL DATE 21/11/25

( ) Unnopphol Harachai
( ) Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 May 2024

Cert.No.: 24TW96
Page.: 2 of 2

Condition of this result of calibration

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : **Dissolved Oxygen Meter Adjustment With Air 100 %**
Dissolved Oxygen Probe No.: 17B100103

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.18	0.0071

This report was certified only for the instrument we tested.It is allowable to use for study Intend to use for advertising and referral purpose is prohibited.This report may not be reproduced other in full,without written approval of the laboratory

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3. EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0 2717 3000 29 FAX.0 2719 9484

ilac-MRA NSC-TISI-TIS17025 CALIBRATION 0000

Certificate of Calibration

Cert. No.: 24LM77
Page.: 1 of 2

Equipment :	DO Meter with Sensor
Manufacturer :	YSI
Model :	5000-115
Serial No. :	17B101473
ID No. :	SGK_CL0073
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Location :	TPA On Site Calibration Laboratory
Received Order :	17 May 2024
Calibrated Date :	27 May 2024
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Khit Ruttanaprapachai
Approved by :	Approved Signatory

( ) Ponpan Paipim
( ) Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 28 May 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2405-0608DSC-2

Cert. No.: 24LM77
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	23I1216	TPA	11 Oct 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment
Function : Temperature measurement.
This instrument was connected with temperature sensor, S/N.: 17B100103

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	60	20.005	19.79	-0.215	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 %.

-o0o-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0 2717 3000 29 FAX.0 2719 9484

Certificate of Calibration

Cert. No.: 25TM156
Page.: 1 of 3

Equipment :	COD Reactor
Manufacturer :	Hach
Model :	DRB200
Serial No. :	21120C1313
ID No. :	SGK_CL0085
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Songkhla Branch) Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Location :	Chemistry Lab
Received Order :	15 January 2025
Calibration Date :	15 - 16 January 2025
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Uthen Kankawi
Approved by :	Approved Signatory

REVIEW BY Ananta B
APPROVED BY Kanitta H
NEXT CAL DATE 15/01/26

( ) Chakrit Waewwanjua
(✓) Suwit Imjai
( ) Kunchit Promprat

Issue Date : 06 February 2025

The Uncertainties are for a confidence probability of approximately 95%

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

Equipment : COD Reactor
Condition As-Received : Used Item
Reference : 2501-0343OC-2
Cert. No.: 25TM156
Page.: 2 of 3

Procedure Used :-

As agreed with customer the calibration was perform using in-house calibration method according to directed measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

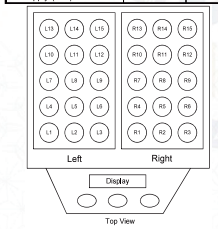
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	23LM95	TPA	19 Jun 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Heat transfer medium used : Alumina Calcined

Environment during calibration	Beginning	Finished
Temp.(°C)	22	22
REL.Humi.(%)	56	55
AC Supply (Volt)	225	225



Top View

Left Position	Left ID No. of Sensor	Right Position	Right ID No. of Sensor
L1	23-01TC-01	R1	23-01TC-01
L2	23-01TC-02	R2	23-01TC-02
L3	23-01TC-03	R3	23-01TC-03
L4	23-01TC-04	R4	23-01TC-04
L5	23-01TC-05	R5	23-01TC-05
L6	23-01TC-06	R6	23-01TC-06
L7	23-01TC-07	R7	23-01TC-07
L8	23-01TC-08	R8	23-01TC-08
L9	23-01TC-09	R9	23-01TC-09
L10	23-01TC-10	R10	23-01TC-10
L11	23-01TC-01	R11	23-01TC-01
L12	23-01TC-02	R12	23-01TC-02
L13	23-01TC-03	R13	23-01TC-03
L14	23-01TC-04	R14	23-01TC-04
L15	23-01TC-05	R15	23-01TC-05

Equipment : COD Reactor
Condition As-Received : Used Item
Reference : 2501-0343OC-2
Cert. No.: 25TM156
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Calibration Point : 150 °C

UUC* Setting (°C)	UUC* Reading (°C)	Measured Temperature (°C) Position						Temperature stability (± °C)	Uncertainty (±°C)	Coverage Factor k
		Left			Right					
Left		L13	L14	L15	R13	R14	R15	Left		
150	150	149.407	149.739	149.671	148.510	148.840	148.458	0.11	1.1	2
		L10	L11	L12	R10	R11	R12			
		149.910	150.069	150.171	148.894	148.931	148.753			
		L7	L8	L9	R7	R8	R9			
Right		150.880	150.841	151.199	150.289	150.358	150.147	Right		
		L4	L5	L6	R4	R5	R6			
150	150	150.618	150.843	151.109	150.350	150.273	149.820	0.11		
		L1	L2	L3	R1	R2	R3			
		150.229	150.688	150.838	150.094	150.115	149.792			

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.
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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SCIMET Co., Ltd.
1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email:scimet2022@gmail.com, Tel: 02 460 9239
https://www.scimet.co.th

Certificate No. C07240192

Calibration Certificate

Equipment: SPECTROPHOTOMETER
Model: DR 3900
Serial No.(or ID): 2403637
Manufacturer: HACH
Condition: New

Job No.: KSMT2403543
Received Date: 25 December 2024
Issued Date: 25 December 2024
Page: 1 of 3

REVIEW BY Ananta B.
APPROVED BY Kanitta H.
NEXT CAL. DATE 25/12/25

Customer
ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd.T. Ban Phru, A Hatyai, Songkhla 90250

Calibration Place
Hach (Thailand) Limited.
Branch 00001, Building D Room No. D3 11, 3rd Floor, No. 735/4, Srinakarin Road, Pattanakarn, Suanluang, Bangkok 10250 Thailand.

Calibration Date
25 December 2024

Environment Condition
Temperature: 22.2 °C ± 0.5 °C
Humidity: 59.2 %RH ± 2.3 %RH

The Method used
In-house method, WI07, based on ASTM E 275-08 and ASTM E 387-04

Traceability
This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.
The standard for Wavelength Certificate No. 108691 and 108692
The standard for Photometric Certificate No. 109010 , 114655

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 SCIMET Co., Ltd.

(Mr. Siwapan Srijan)
Person in charge

(Mr. Thalerngkeat Poungngam)
Authorized signatory

FC07-03: 30 MAY 2023

SCIMET

Certificate No.: C07240192 Page 2 of 3

Condition of reference standards Instruments / CRM:

Instruments	Set No.	Certificate No.	Due date
Holmium Oxide Glass Reference	121512	108691	25-Jan-25
Didymium Oxide Glass Reference	119722	108692	25-Jan-25
Neutral Density Filter Reference	12276	109010 , 114655	2-Feb-25

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength (nm)	Unit Under Calibration (nm)	Correction (nm)	Uncertainty of Measurement (± nm)
333.67	333	0.67	0.59
361.02	361	0.02	0.59
417.80	417	0.80	0.59
441.29	441	0.29	0.59
479.88	480	-0.12	0.59
513.75	513	0.75	0.59
528.59	528	0.59	0.59
537.75	537	0.75	0.59
585.56	585	0.56	0.59
641.95	642	-0.05	0.59
684.70	685	-0.30	0.59
747.61	748	-0.39	0.59
807.04	807	0.04	0.59
879.68	880	-0.32	0.59

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

SCIMET

Certificate No.: C07240192 Page 3 of 3

Calibration Results:
Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance (Abs)	Unit Under Calibration (Abs)	Correction (Abs)	Uncertainty of Measurement(± Abs)
420 nm	0.0000	0.000	0.0000	0.0045
	0.2373	0.234	0.0033	0.0045
	0.5617	0.561	0.0007	0.0045
	0.7392	0.738	0.0012	0.0045
	1.0550	1.056	-0.0010	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2335	0.231	0.0025	0.0045
	0.5513	0.550	0.0013	0.0045
	0.7230	0.722	0.0010	0.0045
	1.0324	1.032	0.0004	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2126	0.210	0.0026	0.0045
	0.5036	0.506	-0.0024	0.0045
	0.6735	0.676	-0.0025	0.0045
	0.9615	0.965	-0.0035	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2201	0.217	0.0031	0.0045
	0.5176	0.520	-0.0024	0.0045
	0.6930	0.694	-0.0010	0.0045
	0.9908	0.994	-0.0032	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2443	0.241	0.0033	0.0045
	0.5530	0.554	-0.0010	0.0045
	0.7196	0.719	0.0006	0.0045
	1.0301	1.031	-0.0009	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2646	0.261	0.0036	0.0045
	0.5370	0.538	-0.0010	0.0045
	0.6862	0.687	-0.0008	0.0045
	0.9822	0.984	-0.0018	0.0045

The End of Certificate

บริษัท ซายน์เมท จำกัด (SCIMET CO., LTD.)
1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2719-9484

Certificate of Calibration

Cert.No.: 25CHO12/1
Page.: 1 of 4

This Certificate was issued to replace to the Certificate No. 25CHO12

Equipment : UV-VIS Spectrophotometer
Manufacturer : Agilent
Model : Cary 60 UV-Vis
Serial No. : MY16510028
ID No. : SGK_CL0040
Condition As-Received: Used Item
Received Date : 15 January 2025
Calibration Date : 15 January 2025
Reference : 2501-0343OC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Songkhla Branch) 114/1 Moo 8 Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Calibration Place : Chemistry Lab
Ambient Temperature : (22.6 to 22.2) °C (On-Site)
Relative Humidity : (57.0 to 56.0) % (On-Site)
Calibration Procedure : In - house method : CP-OCH4 based on ASTM E 275-08
Calibrated by : Uthen Kankawi
Approved by : Approved Signatory
(✓) Chakrit Waewwanjua
( ) Ponpan Paipim
( ) Saithip Meangmai
Issue Date : 13 February 2025

REVIEW BY Ananta B.
APPROVED BY Kanitta H.
NEXT CAL DATE 15/01/26

The Uncertainties are for a confidence probability of approximately 95%

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Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	43532	119613	22 Feb 2026
2. Absorbance Standard set	44487	122584	31 May 2026
3. Wavelength Standard set	36730	118120	15 Jan 2026
4. Wavelength Standard set	36730	118121	15 Jan 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certificate is traceable to the International System of Unit maintained through :
   - Starna Scientific Ltd.
4. Spectral BandWidth : 1.5 nm
   Scan Speed : 40 nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor *k*
241.72	241.0	0.13	2.00
334.06	333.4	0.13	2.00
418.59	418.2	0.13	2.00
573.17	573.3	0.16	2.05
879.29	879.0	0.13	2.00

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor *k*
235.0	Zero	0.0000	0.0046	2.00
	0.4911	0.4925	0.0046	2.00
	0.7389	0.7383	0.0050	2.00
257.0	Zero	0.0000	0.0046	2.00
	0.5719	0.5704	0.0046	2.00
	0.8605	0.8574	0.0050	2.00
313.0	Zero	0.0000	0.0046	2.00
	0.1928	0.1937	0.0046	2.00
	0.2878	0.2881	0.0050	2.00
350.0	Zero	0.0000	0.0046	2.00
	0.4271	0.4261	0.0046	2.00
	0.6391	0.6373	0.0050	2.00
420.0	Zero	0.0000	0.0028	2.00
	0.5750	0.5742	0.0028	2.00
	0.7156	0.7138	0.0028	2.00
	1.0176	1.0156	0.0028	2.00

Remark

- The Potassium Dichromate filled cells are measured against a Perchloric acid blank.
- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- UUC = Unit Under Calibration

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor *k*
440.0	Zero	0.0000	0.0028	2.00
	0.5598	0.5590	0.0028	2.00
	0.7037	0.7021	0.0028	2.00
	1.0013	0.9995	0.0028	2.00
465.0	Zero	0.0000	0.0028	2.00
	0.5222	0.5219	0.0028	2.00
	0.6646	0.6637	0.0028	2.00
	0.9444	0.9436	0.0028	2.00
546.1	Zero	0.0000	***0.0028***	2.00
	0.5234	0.5233	0.0028	2.00
	0.7007	0.6994	0.0028	2.00
	0.9992	0.9982	0.0028	2.00
590.0	Zero	0.0000	0.0028	2.00
	0.5573	0.5572	0.0028	2.00
	0.7760	0.7743	0.0028	2.00
	1.1104	1.1090	0.0028	2.00
635.0	Zero	0.0000	0.0028	2.00
	0.5648	0.5651	0.0028	2.00
	0.7654	0.7644	0.0028	2.00
	1.0961	1.0947	0.0028	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- UUC = Unit Under Calibration

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

-o0o-

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 4-Jul-2024

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

REVIEW BY Ananta B.
APPROVED BY Kanitha H.
NEXT CAL DATE 1/01/24

Calibration Place : Chemical Laboratory
Instrument Name : Cold Room
Manufacturer : Danfoss
Model : N/A
Serial No. : N/A
ID No. : SGK_CL0065
Resolution : 0.1 °C
Received Date : 1-Jul-2024
Calibrated Date : 1-Jul-2024
Ambient Temperature : (30 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrohim Saleemin

Approved by : Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

SCaL

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 2 of 3

Details of Calibration

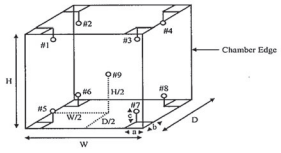
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	PSL-T0707-1/57	22-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5.0 cm	W =	40.0 cm
b =	5.0 cm	H =	40.0 cm
c =	5.0 cm	D =	33.0 cm

SCaL

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 3 of 3

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Cold Room and associates are reported in the manner as shown below

Cal point	Measured Standard Temperature At Spread Locations (°C)									Uncertainty
(°C)	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	(±°C)
4	3.90	4.04	3.72	3.78	3.69	3.76	3.55	3.43	3.34	0.39

3. Performance Result

The performance of the Cold Room are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4	4.0	4.0	0.10	0.75	0.75

- UUC = Unit Under Calibration

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

... End ...

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 22-Oct-2024

Certificate No. : 24CH0526
CSR No. : A163/08133
Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Chemical Laboratory
Instrument Name	:	pH meter
Manufacturer	:	Mettler Toledo
Model	:	S220
Serial No.	:	B625631849
ID No.	:	SGK_CL0030
Electrode No.	:	2281592
Received Date	:	19-Oct-2024
Calibrated Date	:	19-Oct-2024
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %

REVIEW BY ..... Ananta B.
APPROVED BY ..... Kanitta H.
NEXT CAL. DATE 19/4/26

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- CPAchem : CPAchem Ltd
- WK : WK Electric Co., Ltd.
- SCaL : Southern Calibration Service Co., Ltd.,

Calibrated by : Alisara Ma

Approved by : Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.000	61310674	1042701	26-Oct-2025
Standard Solution	7.000	61314184	1042700	26-Oct-2025
Standard Solution	10.01	61313804	1042702	26-Oct-2025
Temperature/Electrical Calibrator	MC2-TE	14987	WK2105-299-223	31-May-2025
Digital Thermometer With Sensor	DP-77	1360896	24SDTH005	7-Aug-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of item : normal condition , no indication for any damage or mulfunction

Result of Calibration :.

1. Electrical Measurement

Applied Voltage (mV)	pH meter Reading (mV)	(pH)	Correction (mV)	Uncertainty (± mV)
177.48	177.5	4.00	-0.02	0.17
0.00	0.0	7.00	0.00	0.13
-177.48	-177.5	10.00	0.02	0.17

2. Before Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	(mV)	Correction (pH)	Uncertainty (± pH)
4.007	3.99	178.1	0.017	0.0092
6.976	7.02	1.7	-0.044	0.019
10.009	9.96	-169.6	0.049	0.038

3. After Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	(mV)	Correction (pH)	Uncertainty (± pH)
4.007	3.99	177.7	0.017	0.0092
6.976	7.01	3.7	-0.034	0.019
10.009	10.00	-169.0	0.009	0.038

4. Temperature Measurement

Cal Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
25	25.021	25.0	0.02	0.060

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

... End ...

Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 13-Jan-2025

Certificate No. : 25MA0125
CSR No. : A101/05028
Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Customer Laboratory
Instrument Name	:	Analytical Balance
Manufacturer	:	Sartorius
Model	:	MSE224S-100-DU
Serial No.	:	34705158
ID No.	:	SGK_CL0045
Resolution	:	0.0001 g
Received Date	:	10-Jan-2025
Calibrated Date	:	10-Jan-2025
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 20) %

REVIEW BY ..... Ananta B.
APPROVED BY ..... Kanitta H.
NEXT CAL. DATE 10/1/26

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.001 based on UKAS LAB 14 : 2015

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- SCaL : Southern Calibration Service Co., Ltd.,

Calibrated by : Hadbordee Dettawee

Approved by : Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Weight Set	2 mg - 1 kg	11119514/01	24SWS001	3-Jul-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Repeatability

Nominal Value (g)	Standard Deviation (g)
10	0.00000
20	0.00000
200	0.00000

2. Effect of tare

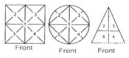
Nominal Value (g)	Standard Value (g)	Balance Reading (g)	Correction (g)
20	20.0000	20.0000	0.0000
40	40.0001	40.0000	0.0001
60	60.0000	60.0000	0.0000
80	80.0001	80.0000	0.0001
100	100.0000	100.0000	0.0000

Result of Calibration :.

3. Off-centre loading

A mass approximately 100g was placed on a pan and moved to various position .
The balance reading obtained are given in the table.

Position 1	2	3	4	5	Maximum Difference (g)
100.0000	100.0000	100.0000	100.0000	100.0001	0.0001



4. Departure from nominal value

Nominal Value (g)	Standard Value (g)	UUC Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor (k)
0.01	0.0100	0.0100	0.0000	0.00008	2.0
0.1	0.1000	0.1000	0.0000	0.00008	2.0
0.5	0.5000	0.5000	0.0000	0.00008	2.0
1	1.0000	1.0000	0.0000	0.00008	2.0
2	2.0000	2.0000	0.0000	0.00008	2.0
5	5.0000	5.0000	0.0000	0.00009	2.0
10	10.0000	10.0000	0.0000	0.00009	2.0
20	20.0000	20.0000	0.0000	0.00009	2.0
40	40.0001	40.0000	0.0001	0.00011	2.0
50	50.0000	50.0000	0.0000	0.00013	2.0
60	60.0000	60.0000	0.0000	0.00013	2.0
80	80.0000	80.0000	0.0000	0.00016	2.0
100	100.0000	100.0001	-0.0001	0.00017	2.0
120	120.0000	120.0001	-0.0001	0.00024	2.0
140	140.0001	140.0000	0.0001	0.00024	2.0
160	160.0000	160.0000	0.0000	0.00026	2.0
180	180.0000	180.0000	0.0000	0.00029	2.0
200	200.0000	200.0000	0.0000	0.00030	2.0

- UUC = Unit Under Calibration

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

...End...

Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 22-Oct-2024

Certificate No. : 24TH4295
CSR No. : A163/08133
Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Chemical Laboratory
Instrument Name	:	Hot Air Oven
Manufacturer	:	Memmert
Model	:	UF110
Serial No.	:	B416.3387
ID No.	:	SGK_CL0024
Resolution	:	0.1 °C
Received Date	:	19-Oct-2024
Calibrated Date	:	19-Oct-2024
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY ..... Ananta B.
APPROVED BY ..... Kanitta H.
NEXT CAL. DATE 19/10/2026

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrorhim Saleemin

Approved by : Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

SCaL

Details of Calibration

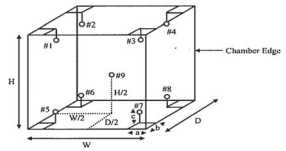
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	PSL-T0707-1/67	22-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5.0 cm	W =	55.0 cm
b =	5.0 cm	H =	48.0 cm
c =	5.0 cm	D =	40.0 cm

SCaL

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Hot Air Oven and associates are reported in the manner as shown below

Cal point	Measured Standard Temperature At Spread Locations (°C)									Uncertainty
(°C)	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	(±°C)
40	40.36	40.40	40.51	40.43	40.05	40.24	40.09	40.14	39.75	0.38
70	70.27	70.30	70.45	70.24	70.24	70.43	70.29	70.30	69.95	0.36
103	102.94	102.90	103.55	102.96	103.22	103.14	103.10	103.01	102.88	0.36
104	104.15	103.99	104.27	104.06	104.09	104.23	104.26	104.15	103.90	0.36
105	105.04	104.90	105.05	104.87	104.91	104.80	104.82	104.98	104.70	0.36
180	179.19	178.93	179.82	179.10	179.27	179.68	179.12	179.73	179.12	0.41

3. Performance Result

The performance of the Hot Air Oven are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
40	40.0	40.0	0.20	0.84	0.84
70	70.0	70.0	0.10	0.59	0.59
103	103.0	103.0	0.20	0.73	0.74
104	104.0	104.0	0.20	0.47	0.56
105	105.0	105.0	0.20	0.44	0.46
180	180.0	180.0	0.50	0.86	1.11

- UUC = Unit Under Calibration

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

... End ...

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibeations@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 13-Jan-2025

Certificate No. : 25TH0227
CSR No. : A101/05028
Page. : 1 of 3

Customer	:	ALS Laboratory Group (Thailand) Co., Ltd 114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru, Amphoe Hat Yai, Songkhla, 90250
Calibration Place	:	Customer Laboratory
Instrument Name	:	Liquid Bath
Manufacturer	:	Memmert
Model	:	WNE29
Serial No.	:	L616.0538
ID No.	:	SGK_CL0035
Resolution	:	0.1 °C
Received Date	:	10-Jan-2025
Calibrated Date	:	10-Jan-2025
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY .... Ananta B.
APPROVED BY .... Kanitha H.
NEXT CAL. DATE 10/7/26

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.014 based on ASTM E 715 : 1980 (reapproved 2001)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrorhim Saleemin

Approved by : Imron Rattanayum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

SCaL

Details of Calibration

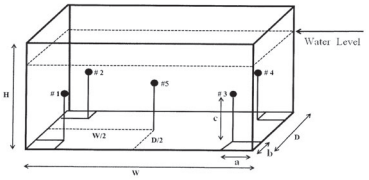
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	PSL-T0707-1/67	22-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5 cm	W =	59.0 cm
b =	5 cm	H =	14.0 cm
c =	5 cm	D =	35.0 cm

SCaL

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Liquid Bath and associates are reported in the manner as shown below

Cal point	Measured Standard Temperature At Spread Locations (°C)					Uncertainty
(°C)	#1	#2	#3	#4	Ref.5	(±°C)
80	80.05	80.07	79.98	80.05	80.06	0.17

3. Performance Result

The performance of the Liquid Bath are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
80	80.0	80.0	0.20	0.17	0.26

- UUC = Unit Under Calibration

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

... End ...

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484

NSC-TISI-TISI7025 CALIBRATION 0008

Certificate of Calibration

Cert.No.: 24CH541
Page.: 1 of 2

Equipment :	Conductivity Meter
Manufacturer :	Mettler Toledo
Model :	SevenCompact S230
Serial No. :	B608134488
ID No. :	SGK_CL0032
Condition As-Received:	Used Item
Received Date :	29 April 2024
Calibration Date :	06 May 2024
Reference :	2404-0708DSC-2
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure:	In -house method : - CP-CH6 by direct measurement with certified reference material (CRM)
Calibrated by :	Warakorn Lerngagtrakul
Approved by :	Saithip Approved Signatory
	( ) Unnopphol Harachai ( ) Ponpan Paipim (✓) Saithip Meangmai
Issue Date :	08 May 2024

Kanitha H
Ananta B
06/05/25

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH541
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	23I1051	05 Sep 2024

- This Certification is traceable to SI Throught Technology Promotion Association (Thailand - Japan)

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

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.00 µS/cm	CPA Chem	931954	01 Oct 2024
1413.0 µS/cm	CPA Chem	940111	02 Nov 2024
12.880 mS/cm	CPA Chem	936625	19 Oct 2024

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) Without Adjustment

Conductivity Electrode Serial No.: 5820120321

Standard Conductivity Solution	UUC* Reading	Uncertainty of Measurement (±)	Coverage factor *k*
84.00 µS/cm	86.4 µS/cm	0.62 µS/cm	2.00
1413.0 µS/cm	1433 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

Remark : **- UUC* = Unit Under Calibration**

- Cell constant = 0.574487 cm^{-1}

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

-o0o-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484

NSC-TISI-TISI7025 CALIBRATION 0008

Certificate of Calibration

Cert.No.: 24CH542
Page.: 1 of 2

Equipment :	Conductivity Meter
Manufacturer :	Mettler Toledo
Model :	SevenCompact S230
Serial No. :	B608134488
ID No. :	SGK_CL0032
Condition As-Received:	Used Item
Received Date :	29 April 2024
Calibration Date :	08 May 2024
Reference :	2404-0708DSC-3
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Kamchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure:	In -house method : - CP-CH6 by direct measurement with certified reference material (CRM)
Calibrated by :	Warakorn Lerngagtrakul
Approved by :	Saithip Approved Signatory

( ) Unnopphol Harachai
( ) Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 08 May 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Cert.No.: 24CH542
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	23I1051	05 Sep 2024

- This Certification is traceable to SI Throught Technology Promotion Association (Thailand - Japan)

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

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.00 µS/cm	CPA Chem	931954	01 Oct 2024

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 84.00 µS/cm

Conductivity Electrode Serial No.: 5816340156

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor *k*
84.00 µS/cm	85.8 µS/cm	84.0 µS/cm	0.62 µS/cm	2.00

Remark : **- UUC* = Unit Under Calibration**

- Cell constant = 0.097780 cm^{-1}

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

-o0o-

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

ISO-TISI-TISI1820 CALIBRATION 0254

CARIBRATION CERTIFICATE

Issued Date : 4-Jul-2024

Certificate No. : 24TH2760
CSR No. : A150/07473
Page. : 1 of 3

Customer	:	ALS Laboratory Group (Thailand) Co., Ltd 114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru, Amphoe Hat Yai, Songkhla, 90250
Calibration Place	:	Microbiological Laboratory
Instrument Name	:	Autoclave
Manufacturer	:	TOMY
Model	:	SX-700
Serial No.	:	52134079
ID No.	:	SGK_ML0001
Resolution	:	1 °C
Received Date	:	1-Jul-2024
Calibrated Date	:	1-Jul-2024
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY Wichapol P.
APPROVED BY Kamtsa H.
NEXT CAL. DATE 1/01/24

Calibration Method Used :
This instrument was calibrated using the Calibration In - house method : SCAL.WI.013 based on BS 2646 : 1993 (part 5)
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- SCaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by : Imron Rattanayium / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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SCaL

Certificate No. : 24TH2760
CSR No. : A150/07473
Page. : 2 of 3

Details of Calibration

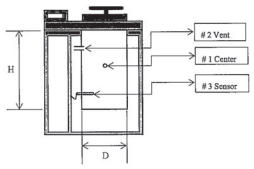
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	GL240	C90432223	24SDAT005	2-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
3. This certificate is not certified any commercial transaction
4. Condition of item : normal condition , no indication for any damage or malfunction

Result of Calibration : (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Chamber Diameter (D) : 30 cm

Chamber Height (H) : 70 cm

SCaL

Certificate No. : 24TH2760
CSR No. : A150/07473
Page. : 3 of 3

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Autoclave and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)			Pressure Reading	Uncertainty (±°C)
	Center #1	Vent #2	Sensor #3		
115	116.3	116.4	116.3	0.07 MPa	0.76
118	119.2	119.2	119.2	0.09 MPa	0.76
121	121.8	121.5	121.6	0.11 MPa	0.76

3. Performance Result

The performance of the Autoclave are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
115	115	115	0.10	0.17	0.17
118	118	118	0.10	0.10	0.10
121	121	121	0.70	0.50	0.84

- UUC = Unit Under Calibration

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

... End ...

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : scalibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 18-Jan-2024

Certificate No. : 24TH0186
CSR No. : A123/06123
Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Microbiological Laboratory
Instrument Name	:	Incubator
Manufacturer	:	Memmert
Model	:	ICP750
Serial No.	:	F816.0061
ID No.	:	SGK_ML0013
Resolution	:	0.1 °C
Received Date	:	15-Jan-2024
Calibrated Date	:	15-Jan-2024
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY Wichapol R.
APPROVED BY Kanitta H.
NEXT CAL. DATE 15/07/25

Calibration Method Used :
This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- SCaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by :
Imron Rattanayum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	23SDAT004	23-May-2024

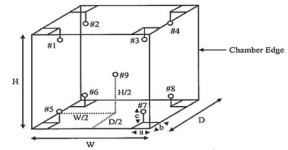
2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration : (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details			Dimension of the chamber		
a =	5.0	cm	W =	104.0	cm
b =	5.0	cm	H =	120.0	cm
c =	5.0	cm	D =	60.0	cm

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Incubator and associates are reported in the manner as shown below

Cal point	Measured Standard Temperature At Spread Locations (°C)									Uncertainty
(°C)	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	(±°C)
35	35.04	34.97	34.90	34.89	35.05	34.91	34.99	34.92	34.94	0.38

3. Performance Result

The performance of the Incubator are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35	35.0	35.0	0.10	0.23	0.25

- UUC = Unit Under Calibration

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

... End ...

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : scalibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 5-Jul-2024

Certificate No. : 24CH0342
CSR No. : A150/07473
Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Microbiological Laboratory
Instrument Name	:	pH meter
Manufacturer	:	Sartorius
Model	:	PB-10
Serial No.	:	C07160695
ID No.	:	SGK_ML0016
Electrode No.	:	P20067003
Received Date	:	2-Jul-2024
Calibrated Date	:	2-Jul-2024
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %

REVIEW BY Wichapol R.
APPROVED BY Kanitta H.
NEXT CAL. DATE 2/07/24

Calibration Method Used :
This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- CPAchem : CPAchem Ltd
- WK : WK Electric Co., Ltd.

Calibrated by : Alisara Ma

Approved by :
Imron Rattanayum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.000	61278486	986239	10-May-2025
Standard Solution	7.000	61281486	986241	10-May-2025
Standard Solution	10.01	61287532	986240	10-May-2025
Temperature/Electrical Calibrator	MC2-TE	14987	WK2106-299-223	31-May-2025

2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration :.

1. Electrical Measurement

Applied Voltage	pH meter Reading		Correction	Uncertainty
(mV)	(mV)	(pH)	(mV)	(± mV)
177.48	177.5	3.80	-0.02	0.17
0.00	0.0	6.90	0.00	0.13
-177.48	-177.5	10.00	0.02	0.17

2. Before Sample Test Measurement

Standard Buffer Solutions	pH meter Reading		Correction	Uncertainty
(pH)	(pH)	(mV)	(pH)	(± pH)
4.008	4.07	164.0	-0.062	0.011
6.985	7.02	-7.1	-0.035	0.020
10.010	10.03	-182.1	-0.020	0.037

3. After Sample Test Measurement

Standard Buffer Solutions	pH meter Reading		Correction	Uncertainty
(pH)	(pH)	(mV)	(pH)	(± pH)
4.008	4.02	164.2	-0.012	0.011
6.985	7.00	-0.9	-0.015	0.020
10.010	10.01	-170.7	0.000	0.037

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

... End ...

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : scalibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 4-Jul-2024

Certificate No. : 24TH2782
CSR No. : A150/07474
Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place	:	Microbiological Laboratory
Instrument Name	:	Liquid Bath
Manufacturer	:	Memmert
Model	:	WPE45
Serial No.	:	L716.0558
ID No.	:	SGK_ML0021
Resolution	:	0.1 °C
Received Date	:	1-Jul-2024
Calibrated Date	:	1-Jul-2024
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY Wichapol R.
APPROVED BY Kanitta H.
NEXT CAL. DATE 1/01/26

Calibration Method Used :
This Instrument was calibrated using the Calibration In - house method : SCAL.WI.014 based on ASTM E 715 : 1980 (reapproved 2001)
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrorhim Saleemin

Approved by :
Imron Rattanayum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

Certificate No. : 24TH2782
CSR No. : A150/07474
Page. : 2 of 3

SCaL

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	PSL-T0707-1/67	22-May-2025

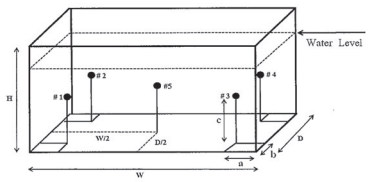
2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :. (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5 cm	W =	45 cm
b =	5 cm	H =	30 cm
c =	5 cm	D =	35 cm

Certificate No. : 24TH2782
CSR No. : A150/07474
Page. : 3 of 3

SCaL

Result of Calibration :.

2. Temperature Measurement Accuracy Test

The measurement results of the Liquid Bath and associates are reported in the manner as shown below

Cal point	Measured Standard Temperature At Spread Locations (°C)					Uncertainty
(°C)	#1	#2	#3	#4	Ref.5	(±°C)
44.5	44.48	44.46	44.51	44.49	44.47	0.14

3. Performance Result

The performance of the Liquid Bath are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	44.5	44.5	0.10	0.14	0.25

- UUC = Unit Under Calibration

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

... End ...

Agilent Technologies

Agilent Technologies (Thailand) Limited
U Chiu Liang Bldg. 22/F UNIT A,D
968 RAMA 4 ROAD, SILOM, BANGRAK
Bangkok 10500 Thailand

Tel: +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Customer Contact:
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan
TAX ID : 0105540004859
tanyatorn.mongkonjirawut@alsglobal.com
027603077

Invoice To:
ALS Laboratory Group (Thailand) Co Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan

Payer:
ALS Laboratory Group (Thailand) Co Ltd Branch Number 0002
114/1 Moo8 Banplu Subdistric Hat Yai District

SONGKHLA 90250
Delivery Site:
ALS Laboratory Group (Thailand) Co Ltd
Branch Number 0002
114/1 Moo8 Banplu Subdistric Hat Yai District

Location:
Room
Bldg
Lab
Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70371013
Service Request:	Service Request Date:
Service Order: 6007493912	Service Confirmation: 6906126918

REVIEW BY Kavinna J.
APPROVED BY Kanitha H.
NEXT CAL. DATE 3/1/24

Direct Inquiries to:
Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

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U Chu Liang Bldg. 22/F Unit A,D
968 Rama 4 Road, Silom, Bangrak,
Bangkok 10500 Thailand
Tax ID : 0105540008218

Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007 ,
THB:Krung Thai Bank PCD.
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330 Thailand

ORGINAL

Page 1 of 3

Service Confirmation Number: 6906126918
Service Confirmation Date: 04.02.2025

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
G7201C	ICP-MS MassHunter SW only (excludes PC)	USH3799575	ICP MS 7900	SYS-IM-7900
G8403A	Agilent 7900 ICP-MS	JP16511669	ICP MS 7900	SYS-IM-7900
G8411A	ISIS 3 for Agilent 7850/7900/8900	JP16510379	ICP MS 7900	SYS-IM-7900

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EOQ	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	03.02.2025	04.02.2025
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Page 2 of 3

Service Confirmation Number: 6906126918
Service Confirmation Date: 04.02.2025

Service Information:

Problem Description:
"PR-DO-ICP MS 7900-5001391286

Service Provided:
OQ_SGK_CL0048
Perform oq test . Sensitivity, resolution background both He and H2 mode. Stability test all pass. Sent oq report to customer. Let s customer test run sample.

Service Overview Code:
Reason Code: Scheduled Service
Diagnosis Code: Scheduled Service
Resolution Code: Scheduled Service

Reported Hours: 7.0	Travel Hours: 2.0	
Customer Field Service Representative Name: Worawit Timakul	Customer Field Service Representative Signature:	Date: 04 Feb 2025
Customer Name: TANYATORN MONGKONJIRAWUT	Customer Signature: Kanitha H.	Date: 04 Feb 2025

Additional Comments:

Page 3 of 3

Southern Calibration Service Co., Ltd.
669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

CARIBRATION CERTIFICATE

Issued Date : 4-Jul-2024

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 1 of 3

Customer	:	ALS Laboratory Group (Thailand) Co., Ltd 114/1 Moo 8, Kamchanawanich Rd Tambon, Ban Phru, Amphoe Hat Yai, Songkhla, 90250
Calibration Place	:	Chemical Laboratory
Instrument Name	:	Cold Room
Manufacturer	:	Danfoss
Model	:	N/A
Serial No.	:	N/A
ID No.	:	SGK_CL0065
Resolution	:	0.1 °C
Received Date	:	1-Jul-2024
Calibrated Date	:	1-Jul-2024
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 30) %

REVIEW BY Ananta B.
APPROVED BY Kanitha H.
NEXT CAL. DATE 1/01/24

Calibration Method Used :
This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20
The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :
This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :
- TISTR : Thailand Institute of Scientific and Technological Research

Calibrated by : Ibrohim Saleemin

Approved by :
Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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SCaL

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 2 of 3

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisiton/Switch Unit	34970A	MY58009813	PSL-T0707-1/67	22-May-2025

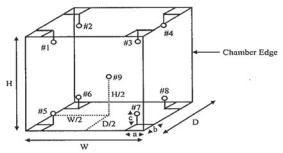
2. The resultes reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or mulfunction

Result of Calibration : (✓) Without Adjustment ( ) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details		Dimension of the chamber	
a =	5.0 cm	W =	40.0 cm
b =	5.0 cm	H =	40.0 cm
c =	5.0 cm	D =	33.0 cm

SCaL

Certificate No. : 24TH2757
CSR No. : A150/07473
Page. : 3 of 3

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Cold Room and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
4	3.90	4.04	3.72	3.78	3.69	3.76	3.55	3.43	3.34	0.39

3. Performance Result

The performance of the Cold Room are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4	4.0	4.0	0.10	0.75	0.75

- UUC = Unit Under Calibration

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

... End ...

REVIEW BY Tanyatorn M.
APPROVED BY
NEXT CAL. DATE 21 Nov 25

Bara Scientific

Certificate of Calibration

Shimadzu LC-HIC

This certificate is to verify that instrument below are calibrated by Bara Scientific Co., Ltd

Instrument	Serial No.
DGU-403	L22166050657
SIL-20AC	L20176012374
CTO-40S	L22236003442
LC-20ADSP	L20106096217
SPD-40	L22256002616
CDD-10Avp	C21346004484
CBM-40lite	L22126103139

For

ALS Laboratory Group (Thailand) Co., Ltd.

Operator Signature: _____ Date: 21 November 2024

(Mr.Thawatchai Toros)

Service Engineer

SHIMADZU
Excellence in Science

Bara Scientific Co.,Ltd.
U Cha Liang Building Floor 7 968 Rama 4 Road Silom Bangrak Bangkok 10500
Thailand Tel : 02-6334300 (auto 20 lines) Fax : 02-6375496-7 www.barascientific.com

บริษัท ดับเบิ้ล เอส ไดแอคนอสติกส์ จำกัด
DOUBLE S DIAGNOSTICS CO., LTD.
4 ซอยอุดมสุข 14 ถนนบางนา-ตราด แขวงบางนา เขตบางนา กรุงเทพฯ 10260 โทรศัพท์ 02) 747-7000 โทรสาร: 02) 747-7008
4 Soi Udomsuk 14, Bangna, Bangkok 10260 Tel. (02) 747-7000 Fax: (02) 747-7008

Maintenance Plan YEAR : 2024

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
วัน								16				

Periodical maintenace check list for Konelab

	6M	12M	Note!
1.Diluent-wash tubing change	☐	☑	
2.ISE tubing change	☒	☒	Done .
3.Syringe check/change		☑	
4.Dispensing check/ change		☑	
5.Waste tubing change when necessary		☑	
6.Lamp check/change	☐	☑	
7.Mixer paddle/paddle change(not Konelab20)		☑	
8.ISE needles check/change		☒	Done .
9.Pump tubing check/ chance	☐	☑	
10.Broken/worn out part check /change		☑	
11.Peristaltic pump check /cleaning/ lubrication	☐	☑	
12.Heating check		☑	
13.Cooling check		☑	
14.Dispenser mechanic check/adjustment	☐	☑	
15.Cuvette transfer mechanic check/adjustment	☐	☑	
16.Dispenser movement check/adjustment	☐	☑	
17.Sample/reagent register check/adjustment	☐	☑	
18.Dispensing tubing tightness check	☐	☑	
19.Photometer and optics cleaning/check/adjustment	☐	☑	
20.Workstation PC cleaning if necessary	☐	☑	
21.Mechanic cleaning/lubrication	☐	☑	
22.Instrument cleaning if necessary	☐	☑	
23.Complete analyzer testing with waterblank/QC or sample	☐	☑	
24.Test parameters/Adjustment/config. Save to USB key	☐	☑	
25.UPS Test	☐	☑	

Place: ALS LAB Instrument: Kso Agrahma
Date/Time: 16/8/62 Serial no: 82981
Service done by: [illegible] Install date: .....
Signature of customer: [signature] Date/Time: 16/8/62

```
Accuracy results          Agrahma 7.2.3@2          Page:  1

                          Laboratory
                          Analyzer User

8/16/2024 14:53
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Performed                 8/16/2024
Lot                       9834
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ACCEPTANCE CRITERIA

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                                    Result      Limit          Warning

Temperature (°C)                    37.8        37.0 +/- 1.0

Dispensing ratio                    16.4        14.8 - 17.2
CV%                                 0.29        <1.7

Photometric noise
Max SD L340_2 (mA)                  0.17        <3.0
Max SD L340_4 (mA)                  0.87        <3.0

Linearity of photometer
Slope                               1.0161      0.94 - 1.06
Curvature                           5.0053      +/- 6.02
Max bias from linear fit (mA)       4.3         <15.0
Max delta %                         -1.6        +/- 6.0

Linearity of sample dispensing
Proport. volume XDISE2 (µl)         2.06        1.96 - 2.16
Proport. volume XDISE4 (µl)         4.14        3.85 - 4.46
XDISE2 CV%                          1.21        <2.0
XDISE4 CV%                          0.80        <2.0
XDISP10 CV%                         0.66        <2.0

Needle 0 µl volume
Zerosys (µ)                         0.005       <0.050
Standard deviation (µ)              0.002       <0.063
Volume (µl)                         0.03        <0.32

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CUSER INFORMATION

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Dispensing ratio                    Photom. noise: SD (mA)

Point Result (µ)                    Point L340_2    L340_4
1     0.1548                        1     0.15      0.80
2     0.1548                        2     0.17      0.78
3     0.1537                        3     0.64      0.63
4     0.1547                        4     0.16      0.71
5     0.1547                        5     0.11      0.88
6     0.1545                        6     0.14      0.87
```

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Accuracy results          Agrahma 7.2.3@2          Page:  2

                          Laboratory
                          Analyzer User

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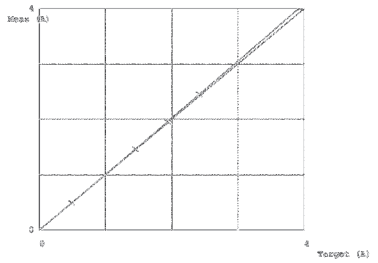
Linearity of sample dispensing

Test        Absorbance (A)
XDISE2      0.306
XDISE4      0.612
XDISP10     1.471

Linearity of photometer

L340_       Target (A)  Meas (A)    Delta (A)   Delta %
1           0.003       0.006       -0.004      -217.7
2           0.464       0.493       -0.007      -1.5
3           1.451       1.459       -0.018      -1.2
4           1.536       1.563       -0.027      -1.6
5           2.415       2.454       -0.039      -1.6
```



ภาคผนวก จ

สำเนาหนังสือรับรองห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๖๑๖๘ กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๐ พฤศจิกายน ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๔ สิงหาคม ๒๕๖๖

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ ๑๘๑ ราย ตามสิ่งที่ส่งมาด้วย ๒

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสิระ จันทร์เฉิด)
นักวิทยาศาสตร์เชี่ยวชาญ รักษาราชการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙
ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th

Green Industry
"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ อก ๐๓๑๐(๑)/ ๑๖๑๖๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๑
๒) นางสาวชัชนัย โกมารกุล ณ นคร	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๒
๓) นายศรายุทธ จิตรานนท์	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๓
๔) นางสาวกนกกร เอนก	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๔
๕) นายสุริยา สอนแก้ว	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๕
๖) นายวิชาญ ชุณหรัต	ทะเบียนเลขที่ ว-๒๐๔-ค-๐๐๐๖

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ อก ๐๓๑๐(๑)/ ๑๖๑๖๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๘๑ ราย

๑) นายกาจบัณฑิต กิตติศุภวณิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๑
๒) นายภัทรพล สว่างไจธรรม์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๒
๓) นายนราธิป เทือกขัยคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๓
๔) นายศิริโชค พงษ์ประสม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๔
๕) นายณัฐวุฒิ ด้วงแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๕
๖) นางสาวจินตา โชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๖
๗) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๗
๘) นางสาวชณัฐกาญจน์ อิ่มชม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๘
๙) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๙
๑๐) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๐
๑๑) นางสาวศรัณยา เฉลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๑
๑๒) นางสาวธัญญธร มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๒
๑๓) นางสาวศิริลักษณ์ บุนนาค	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๓
๑๔) นายนพพงศ์ จันทรุพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๔
๑๕) นายนรเศรษฐ์ โกมาลย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๕
๑๖) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๖
๑๗) นางสาวเกศรินทร์ แก้วมั่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๗
๑๘) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๘
๑๙) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๑๙
๒๐) นางสาวเปมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๐
๒๑) นางสาวศศิธร หมู่สวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๑
๒๒) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๒
๒๓) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๓
๒๔) นายศักดิ์สิทธิ์ ไพศาลพิสุทธิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๔
๒๕) ว่าที่ร้อยตรีหญิง พรรณิภา ข้าเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๕
๒๖) นางจิลดา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๖
๒๗) นางสาวอรวรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๗
๒๘) นางสาวนพรัตน์ แย้มกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๘
๒๙) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๒๙
๓๐) นางสาวดายุรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๐
๓๑) นายพรมมี ศรีปัดเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๑
๓๒) นายอุทิศ อุ่นสิม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๒
๓๓) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๓
๓๔) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๔
๓๕) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๕

๓๖) นางสาวจุฑารัตน์...

๓๖) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๖
๓๗) นางสาวจารุวรรณ พิมพ์อภิกฤติยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๗
๓๘) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๘
๓๙) นางสาวเตือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๓๙
๔๐) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๐
๔๑) นายวรากร ผูกรักษ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๑
๔๒) นายทนง วิริยะสหกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๒
๔๓) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๓
๔๔) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๔
๔๕) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๕
๔๖) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๖
๔๗) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๗
๔๘) นายอาทิตย์ ศรีเสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๘
๔๙) นายเจษฎินทร์ คงศักดิไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๔๙
๕๐) นายจรัส บุญยิ่ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๐
๕๑) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๑
๕๒) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๒
๕๓) นางสาวสุภาชวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๓
๕๔) นางสาวทัตพร ขวาสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๔
๕๕) นางสาวธิติมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๕
๕๖) นางสาวภานุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๖
๕๗) นางสาวอุไรรัตน์ ทีงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๗
๕๘) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๘
๕๙) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๕๙
๖๐) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๐
๖๑) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๑
๖๒) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๒
๖๓) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๓
๖๔) นางศิลาวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๔
๖๕) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๕
๖๖) นายนวภัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๖
๖๗) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๗
๖๘) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๘
๖๙) นายสมบูรณ์ บุตรจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๙
๗๐) นายวิรัตน์ ไชยนะรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๐
๗๑) นายนฤเบศน์ เพิ่มพูน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๑
๗๒) นายจิรณัฐ ขาวสะออ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๒
๗๓) นายอัสรี นามบุรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๓
๗๔) นายอัศวเรศ จ่อสาว	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๔

๗๕) นายประเสริฐ...

๗๕) นายประเสริฐ สุระขันธ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๕
๗๖) นายนุกูล จันทร์เนียม ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๖
๗๗) นายพีรพงษ์ ทองคูณบรีดา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๗
๗๘) นายนฤพล ทองนุช ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๘
๗๙) นายอนุวัฒน์ ม่วงแพร ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๗๙
๘๐) นายเจตศราวุฒิ ปัตตะมะ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๐
๘๑) นายกฤษณะ สายวรรณ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๑
๘๒) นายพิชัย บุญยงค์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๒
๘๓) นายภานุพงศ์ โฮมวงศ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๓
๘๔) นายสามารถ คุ้มปลี ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๔
๘๕) นายสัญชัย โกศรีนาม ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๕
๘๖) นายณัฐวุฒิ ศรีประเสริฐ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๖
๘๗) นายชวัลธัช นาคพนม ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๗
๘๘) นายพงศธร ชัยทิพย์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๘
๘๙) นายสิทธิโชค ทาสีดา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๘๙
๙๐) นายธนากร อินสุดา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๐
๙๑) นางสาววรณิชชา ชาติวันชัย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๑
๙๒) นางสาวพิมพ์ตะวัน มินากูล ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๒
๙๓) นางสาวเพชรัตน์ สิงห์สมบุญ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๓
๙๔) นางสาวชญานิน พรหมจันทร์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๔
๙๕) นายกีรติ ทวีราช ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๕
๙๖) นายจักริน หมั่นวิชา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๖
๙๗) นายฉัตรชัย สุขเปีย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๗
๙๘) นายณรนนท์ ตีะทองคำ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๘
๙๙) นายคุลยพล สนนอก ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๙๙
๑๐๐) นายทักษ์ดนัย อุบลศรี ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๐
๑๐๑) นายธนศวร นามะกุณณา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๑
๑๐๒) นายธิติพงศ์ บัวแดง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๒
๑๐๓) นายนนทชัย อุปถัมภ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๓
๑๐๔) นายนัฐพล คุณสุทธิ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๔
๑๐๕) นายนันทวัฒน์ สาริน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๕
๑๐๖) นายปิยะนัฐ พลมะศรี ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๖
๑๐๗) นายพงศ์สิริ โสมเขียว ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๗
๑๐๘) นายพีรพัฒน์ กำคำ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๘
๑๐๙) นายภาณุพงศ์ มานิตย์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๐๙
๑๑๐) นายมงคล ผลาทิพย์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๐
๑๑๑) นายสิรินนท์ ทองอ่ัน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๑
๑๑๒) นายอเนชา หันสมัย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๒
๑๑๓) นายอดิศักดิ์ ผมไผ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๓

๑๑๔) นายอนันตชัย...

๑๑๔) นายอนันตชัย วีสม ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๔
๑๑๕) นายวรวุธ ดีนัก ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๕
๑๑๖) นายแสงตะวัน นะตะลัต ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๖
๑๑๗) นายยุทธพงศ์ รัตนะ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๗
๑๑๘) นายชยัณวุฒิ ไชยชะนิจ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๘
๑๑๙) นายวิศรุต ศรีธรรมมา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๑๙
๑๒๐) นายนนทกร เผือกผ่อง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๐
๑๒๑) นายกำชัย สุทธะ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๑
๑๒๒) นางสาวณัฐกรณ์ บุญตะนัย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๒
๑๒๓) นางสาวพัชรินทร์ แสนสร้อย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๓
๑๒๔) นายไพรวัลย์ เปรียมพิมาย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๔
๑๒๕) นางสาวศุภมาศ ทองมาก ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๕
๑๒๖) นางสาวลลิตา จิตรสว่าง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๖
๑๒๗) นางสาวชไมพร เลิกภู่เขียว ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๗
๑๒๘) นางสาวกฤติมาพร คำมีแก่น ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๘
๑๒๙) นางสาวสกุลรัตน์ ภาคภูมิ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๙
๑๓๐) นางสาวไพรินทร์ ศรีรูปี ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๐
๑๓๑) นางสาวทิพเนตร ผุยปัญญา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๑
๑๓๒) นางสาวสาธิตา ปานทอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๒
๑๓๓) นางสาวอริสา ทองนวล ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๓
๑๓๔) นางสาวอรยา ค้าคล่อง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๔
๑๓๕) นางสาวชุดาภรณ์ สุนทรสนาน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๕
๑๓๖) นางสาวอัญชลี คำจันทร์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๖
๑๓๗) นายบุญฤทธิ์ เอี่ยมเทศ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๗
๑๓๘) นางสาวศุภรดา ปั้นมยุรา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๘
๑๓๙) นางสาวพาฤดี คุณนาน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๙
๑๔๐) นางสาวจิราเจต ฟองดา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๐
๑๔๑) นางสาวอารยา มีชัย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๑
๑๔๒) นางสาววิชชุตา นาคผจญ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๒
๑๔๓) นางสาวนันทิยา จันทะลุน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๓
๑๔๔) นายกิตติพงศ์ แซ่ลี้ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๔
๑๔๕) นายอนุวัติ ภูถวิล ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๕
๑๔๖) นายธีรพล แสงทอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๖
๑๔๗) นายศักดิ์พิพัฒน์ บุญมั่น ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๗
๑๔๘) นายฐิติวัลค์ เอมอุไร ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๘
๑๔๙) นายชัยณรงค์ ศรีบุรินทร์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๔๙
๑๕๐) นางสาวอัจฉราวรรณ สวนสนอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๐
๑๕๑) นางสาวณัฐฐาพร สิงหา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๑
๑๕๒) นายภีมเรศ แหยมโต ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๒

๑๕๓) นางสาวอุบล...

๑๕๓) นางสาวอุบล เหิกศิริ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๓
๑๕๔) นางสาวมโนรัตน์ ทองบุตร ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๔
๑๕๕) นายภาคภูมิ แทนไทย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๕
๑๕๖) นางสาวสุภาณัฐ เมล์พ่วง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๖
๑๕๗) นางสาวพรทิวา สาตาชนม์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๗
๑๕๘) นายเอกวิทย์ วันทะนา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๘
๑๕๙) นายไตรมณฑล ทิพย์วรรณ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๕๙
๑๖๐) นายจิรเมธ ประเสริฐสิริพงศ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๐
๑๖๑) นายจิรายุส เกษมสุข ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๑
๑๖๒) นายจีรศักดิ์ ศรีวิชัย ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๒
๑๖๓) นายณัฐกฤษณ์ สะพานแก้ว ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๓
๑๖๔) นายบูรณศักดิ์ ปะทิ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๔
๑๖๕) นายปัณณวิชญ์ เสมอทรัพย์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๕
๑๖๖) นายพิษณุพงษ์ ไชยา ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๖
๑๖๗) นายภัทรพงษ์ มณฑาทอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๗
๑๖๘) นายวสันต์ ตรีนกุล ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๘
๑๖๙) นายภาณุเดช เพชรอุด ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๖๙
๑๗๐) นายอนุกูล วิละแสง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๐
๑๗๑) นายภัทรพงษ์ มีสุข ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๑
๑๗๒) นางสาวนุชรี ลีละทีป ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๒
๑๗๓) นางสาวสุภาวดี โกศรีนาม ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๓
๑๗๔) นางสาวอรณิช เพียนตำ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๔
๑๗๕) นางสาวพรเพ็ญ ชอบสอน ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๕
๑๗๖) นางสาววันวิสา ขอนพิกุล ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๖
๑๗๗) นางสาวอรวรรณ เถาว์ทอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๗
๑๗๘) นางสาวอัยย์ลิณ เมอร์วิณณ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๘
๑๗๙) นางสาวรวิสรา คุ่ยครอง ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๗๙
๑๘๐) นายวุฒิกร ศิริวรรณ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๐
๑๘๑) นางสาวจารุวรรณ กระจ่างพันธุ์ ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๑

สิ่งที่ส่งมาด้วย ๓

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๒๐๔
ที่ อก ๐๓๑๐(๑)/ ๑๖๑๖๘ ลงวันที่ ๒๐ พฤศจิกายน ๒๕๖๖

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๗๔ รายการ

น้ำเสีย จำนวน 60 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method[4]
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method[4]
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method[4]
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
6	Barium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method[4] 2) 5-Day BOD Test, Membrane Electrode Method[4]
12	Carbaryl	High-Performance Liquid Chromatographic Method[4]
13	Carbofuran	High-Performance Liquid Chromatographic Method[4]
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method[4] 2) Closed Reflux, Tritimetric Method[4]
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
17	Chromium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method[4]

19 Copper...

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

40 Manganese...

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

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

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

18 Bis(2-ethylhexyl)phthalate...

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

36 Chrysene...

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

56 1,3-Dichloropropene...

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

76 γ-HCH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
81	Lead	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
89	2-Methylnapthalene	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...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
98	pH	Electrometric Method[4]
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
100	Phenol	1) Distillation, Chloroform Extraction Method[4] 2) Distillation, Direct Photometric Method[4] 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
102	Selenium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
103	Silver	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
109	TPH (C_5-C_8)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[14,25]

110 TPH ($C_{>8}$-C_{16})...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH ($C_{>8}$-C_{16})	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method[9,22]
111	TPH ($C_{>16}$-C_{35})	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method[9,22]
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method[4]
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[4]
126	Zinc	1) Digestion, Inductively Coupled Plasma Method[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[4]

อากาศเสีย...

อากาศเสีย (ปล่องระบาย) จำนวน 28 รายการ

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

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[5] 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method[5]
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
19	Opacity	Ringelmann's Method[2]
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method[5] 2) Absorption Sampling, Alkaline Permanganate/ Colorimetric Method[5] 3) Instrumental Analyzer Method[5]
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method[5] 2) Instrumental Analyzer Method[5]
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method[5]
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method[5] 2) Paired Train, Isokinetic Sampling, Gravimetric Method[5]

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[5]
28	Xylene	Adsorption Sampling, Gas Chromatographic Method[5]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]

5 Beryllium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method[1,6,16,19] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method[1,6,17,19] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method[7,8,16,19] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method[7,8, 17,19]

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method[1,6,19] 2) Alkaline Digestion, Colorimetric Method[8,19]
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26]

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
		2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]

22 Mercury...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[1,6,20] 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method[1,6,30] 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[20] 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method[30] 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method[21]
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic /Mass Spectrometric Method[11,26]
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic / Mass Spectrometric Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic /Mass Spectrometric Method[11,26]
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method[1,6,17] 3) Digestion, Inductively Coupled Plasma Method[7,16] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[1,9,26] 2) Soxhlet Extraction, Gas Chromatographic Method[10,26] 3) Automated Soxhlet Extraction, Gas Chromatographic Method[11,26]

- 2-Chlorobiphenyl...

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

31 Silver...

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

ดิน...

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
2	Acetone	1)Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method[13]
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
5	Antimony	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
8	Barium	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
21	Butanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method[13,25]
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]

23 Cadmium...

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

36 Chrysene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
37	Cyanide	Extraction, Distillation, Colorimetric Method[27,28,29]
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]

49 1,2-Dichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[30,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]

63 Di-n-Octyl Phthalate...

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

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	α-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
81	Lead	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[20] 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry[21] 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method[30]

84 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method[13,25]
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]

96 Polychlorinated biphenyls (PCBs)

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

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
101	Selenium	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
102	Silver	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
108	TPH (C_5–C_8)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
109	TPH ($C_{>8}$– C_{16})	1) Automate Extraction, Gas Chromatographic Method[11,22] 2) Solvent Extraction, Gas Chromatographic Method[12,22] 3) Ultrasonic Extraction, Gas Chromatographic Method[22,31]
110	TPH ($C_{>16}$ – C_{35})	1) Automate Extraction, Gas Chromatographic Method[11,22] 2) Solvent Extraction, Gas Chromatographic Method[12,22] 3) Ultrasonic Extraction, Gas Chromatographic Method[22,31]
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]

115 2,4,5-Trichlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[10,26] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method[11,26]
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method[15,25]
125	Zinc	1) Digestion, Inductively Coupled Plasma Method[7,16] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method[7,17]

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ที่ อก ๐๓๑๐(๑)/ ๔๑๒๑

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๕ เมษายน ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอเอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๙ มีนาคม ๒๕๖๗

ตามคำขอที่อ้างถึง บริษัท เอเอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๖๕
๒) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๒๑
๓) นางสาวศุภรดา ปิ่นมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๓๘

๒. ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

๑) นางสาวฐานิดา กลิ่นเชียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๒
๒) นางสาวกัญญ์ภัสสร สายคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๓
๓) นางสาวณัฐนันท์ กันทะวงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๔
๔) นายอำนาจ วงษาเคน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๕
๕) นายกฤษณพล ปัญญาวงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๖
๖) นายณชากร หรรษา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๗
๗) นายวัชรินทร์ ผ่องสามสวน	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๘
๘) นายณัฐพงศ์ โสภา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๘๙
๙) นายศักรินทร์ ปานเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๐
๑๐) นายณัฐพล ชุ่มชื่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๑
๑๑) นายธนา สุพาพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๒
๑๒) นายนราธร แก้วพงษ์ษา	ทะเบียนเลขที่ ว-๒๐๔-จ-๐๑๙๓

อนึ่ง หนังสือฉบับนี้...

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ในวันที่ ๒ กันยายน ๒๕๖๙

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพรยศ กลั่นกรอง)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
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