

# ภาคผนวก ง

เอกสารการสอบเทียบเครื่องมือตรวจวิเคราะห์



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Ethylene	Pitot Tube	BKK_FS0472	10-Jan-25	10-Jul-25	6
Stack	Ethylene	Flue gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Ethylene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Stack	Ethylene	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Stack	Ethylene	Air Sampling Pump	RYG_FS0132	6-Apr-25	6-Jul-25	3
Stack	Ethylene	Air Sampling Pump	RYG_FS0509	6-Apr-25	6-Jul-25	3
Stack	Propane	Pitot Tube	BKK_FS0472	10-Jan-25	10-Jul-25	6
Stack	Propane	Flue gas Analyzer	RYG_FS0465	19-Feb-25	18-Feb-26	12
Stack	Propane	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Stack	Propane	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Stack	Propane	Air Sampling Pump	RYG_FS0132	6-Apr-25	6-Jul-25	3
Stack	Propane	Air Sampling Pump	RYG_FS0509	6-Apr-25	6-Jul-25	3
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0724	18-Sep-24	18-Mar-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0647	15-Jan-25	16-Jul-26	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0215	22-Oct-24	22-Oct-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0018	21-Jan-25	21-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0622	21-Jan-25	21-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0628	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Calibrator	RYG_FS0215	16-Jan-25	16-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0016	19-Sep-24	19-Sep-25	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0020	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0024	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0025	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0027	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0029	11-Jul-24	11-Jul-25	12
Noise	Leq 8 hrs / Leq 12 hrs	Sound Level Meter	RYG_FS0031	30-Aug-24	30-Aug-25	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0211	2-Dec-24	2-Dec-25	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0033	17-Sep-24	17-Sep-25	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0210	12-Feb-25	11-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0039	17-Sep-24	17-Sep-25	12
Workplace	Ethylene	DRYCAL FLOWMETER	RYG_FS0208	13-Feb-24	13-Aug-25	18
Workplace	Ethylene	DRYCAL FLOWMETER	BKK_FS0614	21-May-24	21-May-25	12
Workplace	Ethylene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Ethylene	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Ethylene	Air Sampling Pump	RYG_FS0111	7-Jan-25	7-Apr-25	3
Workplace	Ethylene	Air Sampling Pump	RYG_FS0124	6-Jan-25	6-Apr-25	3
Workplace	Ethylene	Air Sampling Pump	RYG_FS0139	6-Jan-25	6-Apr-25	3
Workplace	Ethylene	Air Sampling Pump	RYG_FS0147	7-Apr-25	7-Jul-25	3
Workplace	Ethylene	Air Sampling Pump	RYG_FS0158	7-Apr-25	7-Jul-25	3
Workplace	Ethylene	Air Sampling Pump	RYG_FS0165	7-Apr-25	7-Jul-25	3
Workplace	Propane	DRYCAL FLOWMETER	RYG_FS0208	13-Feb-24	13-Aug-25	18
Workplace	Propane	DRYCAL FLOWMETER	BKK_FS0614	21-May-24	21-May-25	12
Workplace	Propane	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Propane	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Propane	Air Sampling Pump	RYG_FS0111	7-Jan-25	7-Apr-25	3
Workplace	Propane	Air Sampling Pump	RYG_FS0124	6-Jan-25	6-Apr-25	3
Workplace	Propane	Air Sampling Pump	RYG_FS0139	6-Jan-25	6-Apr-25	3
Workplace	Propane	Air Sampling Pump	RYG_FS0147	7-Apr-25	7-Jul-25	3
Workplace	Propane	Air Sampling Pump	RYG_FS0158	7-Apr-25	7-Jul-25	3
Workplace	Propane	Air Sampling Pump	RYG_FS0165	7-Apr-25	7-Jul-25	3
Workplace	Total Hydrocarbon as Methane	DRYCAL FLOWMETER	RYG_FS0208	13-Feb-24	13-Aug-25	18
Workplace	Total Hydrocarbon as Methane	DRYCAL FLOWMETER	BKK_FS0614	21-May-24	21-May-25	12
Workplace	Total Hydrocarbon as Methane	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Total Hydrocarbon as Methane	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0108	6-Jan-25	6-Apr-25	3
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0114	6-Jan-25	6-Apr-25	3
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0136	7-Jan-25	7-Apr-25	3
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0146	6-Apr-25	6-Jul-25	3
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0156	7-Apr-25	7-Jul-25	3
Workplace	Total Hydrocarbon as Methane	Air Sampling Pump	RYG_FS0159	7-Apr-25	7-Jul-25	3
Workplace	Total Hydrocarbon as Methane	Total Hydrocarbon Analyzer	RYG_EN0038	25-Jul-24	25-Jul-25	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	19-Jan-24	19-Jul-25	18
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	20-Jan-25	20-Jul-26	18
Rayong Lab	BOD	Incubator	RYG_EN0154	1-Nov-24	1-May-26	18
Rayong Lab	BOD	Burette	RYG_EN0216	28-Sep-24	24-Sep-25	12
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	20-Feb-25	20-Feb-26	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG_EN0010	21-Mar-24	21-Sep-25	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	20-Feb-25	20-Feb-26	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	21-Mar-24	21-Sep-25	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	20-Feb-25	20-Feb-26	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0213	19-Mar-25	19-Mar-26	12
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	21-Mar-24	21-Sep-25	18
Rayong Lab	Temperature	pH meter	RYG_FS0296	1-Jul-24	1-Jul-25	12

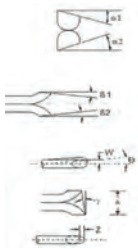
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Type S Pitot Tube Calibration

Date Calibration 10-Jan-25 Due Date 10-Jul-25  
Pitot ID BKK\_FS0472 Inclinator ID BKK\_FS1131  
Pitot SN Vernier ID RYG\_FS0539



Parameter	Value	Allowable Range	Check
$\alpha 1$	-5.1	$-10^\circ < \alpha 1 < +10^\circ$	OK
$\alpha 2$	6.7	$-10^\circ < \alpha 2 < +10^\circ$	OK
$\beta 1$	2.0	$-5^\circ < \beta 1 < +5^\circ$	OK
$\beta 2$	-4.2	$-5^\circ < \beta 2 < +5^\circ$	OK
$\gamma$	3.7	-	-
$\theta$	0.2	-	-
$Z = A \tan \gamma$	0.058	$Z \leq 0.125''$	OK
$W = A \tan \theta$	0.003	$W \leq 0.031''$	OK
Dt	0.30	$0.188'' \text{ to } 0.375''$	OK
A/2Dt	1.50	$1.05 \leq \text{PA/Dt} \leq 1.5$	OK
A	0.9	$2.10t \leq A \leq 3Dt$	OK

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

Calibrated by: (Mr. Warawut Pubpa)  
RYG Field Services Scientist (3)  
Approved By: (Mr. Natthapol Jiengwareewong)  
RYG Field Services Specialist (1)



Calibration Certificate



Certificate No: G 680111  
Date of issue : 19-Feb-25

Instrument description : Flue Gas Analyzer  
Instrument model : Testo 340  
Control unit serial no. : -  
Instrument serial no. : 62150585  
ID no. or control no. : RYG\_FS0465  
Manufacturer : Testo SE & Co. KGaA  
Probe description : -  
Probe model : -  
Probe serial no. : -  
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.  
Customer address : 104 Phattharakan 40, Phatthakan Road, Khwaeng Phatthakan, Khet Suan Luang, Bangkok, 10250 Thailand

REVIEW BY: S.T.S.

APPROVED BY: S.T.S.

NEXT CAL DATE: 18/02/2026

Total pages of certificate : 2 Pages  
Receiving no. : L-250514  
Receiving date. : 18-Feb-25  
Parameter of calibration : Gas Calibration (Oxygen 2.50, 9.984, 21.02 %vol, Carbon Monoxide 80.45, 302.1, 1007 ppm, Nitric Oxide 30.0, 151.8, 322.5 ppm, Sulphur Dioxide 50.36, 100.7, 600.8 ppm)  
Condition of UUC. : Used  
Ambient condition : All of the Measurement were carried out the stabilized laboratory  
Temperature : 23 ± 5 °C  
Humidity : 55 ± 15 %RH  
Calibration place : 17/121 Soi Ngarmwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210  
Calibration procedure no : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction: no. WI-CL-28-C

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

Date of calibration : 19-feb-25

(Mr. Kwanchai Khamsing)  
Calibration Technician

(Mrs. Nongluck Wongsettee)  
Technical Manager

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen ( O <sub>2</sub> ) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen ( O <sub>2</sub> ) 9.984 % Vol	CG-0113-24	Nimic	01-Aug-29
Oxygen ( O <sub>2</sub> ) 21.02 % Vol	CG-0041-22	Nimic	10-Feb-27
Carbon monoxide ( CO ) 80.45 ppm	CG-0132-24	Nimic	10-Sep-29
Carbon monoxide ( CO ) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide ( CO ) 1007 ppm	1870/24	Linde	17-Jun-26
Nitric Oxide ( NO ) 30.0 ppm	CG-0065-24	Nimic	06-May-26
Nitric Oxide ( NO ) 151.8 ppm	0404/25	Linde	09-Feb-27
Nitric Oxide ( NO ) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide ( SO <sub>2</sub> ) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide ( SO <sub>2</sub> ) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide ( SO <sub>2</sub> ) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.9 °C Humidity : 66.4 %RH Pressure : 1010.8 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 700 ml/min Gas pressure : 1014.5 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O <sub>2</sub> (%Vol)	2.50	2.44	-0.06	0.15
O <sub>2</sub> (%Vol)	9.984	9.91	-0.074	0.20
O <sub>2</sub> (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.45	81	0.55	3.0
CO (ppm)	302	301	-1	6.0
CO (ppm)	1007	1005	-2	12
NO (ppm)	30.0	32	2.0	8.0
NO (ppm)	151.8	154	2.2	8.0
NO (ppm)	322.5	323	0.5	12
SO <sub>2</sub> (ppm)	50.36	49	-1.36	6.0
SO <sub>2</sub> (ppm)	100.7	101	0.3	6.0
SO <sub>2</sub> (ppm)	600.8	603	2.2	13

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

End of Report

Certificate of Calibration

Customer

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

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter  
Manufacturer : Mesa Labs  
Model : 200-510L  
Serial Number : 130027  
ID : RYG\_FS0208

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

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 : 21 January 2025  
Calibration Date : 27 January 2025

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

Reference Standard	Model	Serial Number	Traceable	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	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne AZLA 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 : 27 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

Certificate No : 25-AFM-023

Request No : Req-2025-0169

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
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass I
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass I
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass I
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass I
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass I
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass I
22.80	100.90	400	402.96	3.0	11	4.0	Pass I
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass I

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 :

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

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

\* Indicates not accredited

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

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

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Decision Rule for Statements of Conformity

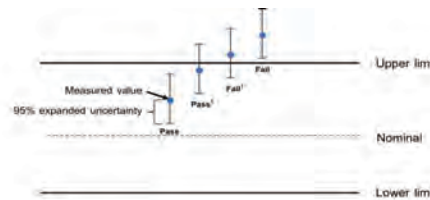
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8-09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass<sup>1</sup> - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail<sup>1</sup> - 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



### 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

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

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 : 30 August 2024  
Calibration Date : 9 September 2024

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



Reference Standard	Model	Serial Number	Traceable	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 AZLA 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 : [Signature]  
Mr. Noppadon Luangrat  
Service Calibration Engineer

Approved By : [Signature]  
Mr. Pait Muthavorn  
Calibration Engineer Supervisor  
Issue Date : 9 September 2024

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

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 :

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

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.

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

Certificate No : 24-AFM-179

Request No : Req-2024-1987

#### Decision Rule for Statements of Conformity

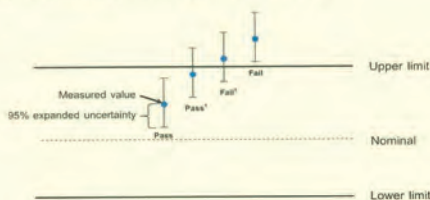
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass<sup>1</sup> - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail<sup>1</sup> - 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

ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,  
Phatthanakan, Suan Luang, Bangkok 10250  
T +66 2 780 3000 F +66 2 780 3197



## Certificate of Calibration

Certificate No. C-060425-RYG\_FS0132

#### Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump  
Brand : Gillan  
Model/Type : GilaAir Plus  
Equipment ID : RYG\_FS0132  
Serial No. : 20200211508  
Calibration Date : 06-Apr-25  
Next calibration date : 06-Jul-25

#### Reference Standard Low Flow Meter

Equipment name : Air Flow Meter  
Brand : MesaLabs  
Model/Type : Defender 510-L  
Equipment ID : RYG\_FS0208  
Serial No. : 130027  
Calibration Date : 27-Jan-25  
Due Date : 26-Jan-26

#### Reference Standard High Flow Meter

Equipment name : Air Flow Meter  
Brand : MesaLabs  
Model/Type : Defender 510-M  
Equipment ID : BKK\_FS0614  
Serial No. : 151114  
Calibration Date : 9-Sep-24  
Due Date : 9-Sep-25

#### Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.6	20.8	20.3	20.2	5%	19 - 21	Passed
50	50.9	51.2	50.4	50.8	5%	48 - 53	Passed
100	102.8	101.9	103.4	102.7	5%	95 - 105	Passed
200	203.3	202.4	202.7	202.8	5%	190 - 210	Passed
High Flow							
500	502.1	502.8	504.1	503.0	3%	485 - 515	Passed
1000	1012.3	990.6	979.9	994.3	3%	970 - 1030	Passed
2000	1994.9	2004.6	1998.1	1999.2	3%	1940 - 2060	Passed
2500	2507.3	2519.0	2494.4	2506.9	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By : [Signature]  
( Mr. Watcharin Pongsamuan )  
RYG Field Services Scientist (1)

Issue date : 06-Apr-25

Approved By : [Signature]  
( Mr. Supot Salameh )  
RYG Field Services Section Head



## Certificate of Calibration

Certificate No. : C-060425-RYG-FS0509

Air Sampling Pump Detail			
Equipment name : Personal Air Sampling Pump	Equipment ID : RYG_FS0509		
Brand : Gillan	Serial No. : 20201110104		
Model/Type : GIIAir Plus	Calibration Date : 06-Apr-25		
	Next calibration date : 06-Jul-25		

Reference Standard Low Flow Meter			
Equipment name : Air Flow Meter	Equipment ID : RYG_FS0208		
Brand : MesaLabs	Serial No. : 130027		
Model/Type : Defender 510-L	Calibration Date : 27-Jan-25		
	Due Date : 26-Jan-26		

Reference Standard High Flow Meter			
Equipment name : Air Flow Meter	Equipment ID : BKK_FS0614		
Brand : MesaLabs	Serial No. : 151114		
Model/Type : Defender 510-M	Calibration Date : 9-Sep-24		
	Due Date : 9-Sep-25		

Calibration Data							
Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.5	19.4	19.6	19.5	5%	19 - 21	Passed
50	51.0	50.8	51.1	51.0	5%	48 - 53	Passed
100	101.2	101.0	100.2	100.8	5%	95 - 105	Passed
200	203.0	204.8	205.6	204.5	5%	190 - 210	Passed
High Flow							
500	500.1	498.8	499.7	499.5	3%	485 - 515	Passed
1000	1006.0	1002.3	999.9	1002.7	3%	970 - 1030	Passed
2000	1999.1	2004.0	1999.3	2000.8	3%	1940 - 2060	Passed
2500	2507.4	2502.5	2503.8	2504.6	3%	2425 - 2575	Passed

### END OF REPORT

Calibrated By:   
( Mr. Natchapon Thamklang )  
RYG Field Services Scientist (1)  
Issue date : 06-Apr-25

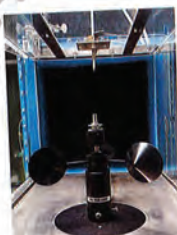
Approved By:   
( Mr. Supot Salameh )  
RYG Field Services Section Head

**MEASUREMENT RESULTS**  
The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer 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 10 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 90 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 1 m/s. 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 <sub>ref</sub> (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V <sub>uuc</sub> (m/s)	Error (m/s)	U (k=2) (m/s)
1.136	25.30	25.25	1.0	-0.1	0.31
1.349	25.24	25.25	2.0	-0.2	0.31
3.085	25.18	25.25	3.0	-0.1	0.31
4.221	25.22	25.25	4.0	-0.2	0.31
5.01	25.18	25.25	5.0	0.0	0.31
6.01	24.90	25.25	6.0	0.0	0.31
6.95	25.10	25.25	7.0	0.1	0.31
7.94	25.00	25.25	8.0	0.1	0.31
9.02	25.12	25.25	8.9	-0.1	0.31
10.00	24.74	25.25	10.1	0.1	0.31
10.99	24.96	25.25	11.0	0.0	0.31
12.00	24.62	25.25	12.0	0.0	0.31
12.99	24.58	25.25	13.0	0.0	0.31
13.97	24.50	25.25	14.0	0.0	0.31
14.96	24.50	25.25	14.9	0.0	0.31
15.90	24.50	25.25	15.0	0.1	0.42

**Remarks:**  
\* Calibration results only valid for the tested circumstances and environmental conditions during which calibration took place  
\* Velocity of standard  
\* Velocity of UUC Under Calibration

### PHOTO OF CALIBRATION SET-UP



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



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NSC-TIS-TIS 17025  
CALIBRATION 0367

Air speed measurement laboratory  
Calibration services department.



NSC - TIS - TIS 17025  
CALIBRATION 0367

Certificate Number

CWS-046-67

## CERTIFICATE OF CALIBRATION

<b>MEASUREMENT ITEM</b>	: Cup anemometer
<b>MANUFACTURER</b>	: Novallux
<b>MODEL/TYPE</b>	: Sensor: WS-02FA Data logger: 11B-WS-250L-D
<b>SERIAL NUMBER</b>	: Sensor: WSD-A6069 Data logger: A6069 RYG_FS0724
<b>ID NUMBER</b>	: New Item
<b>CONDITION AS RECEIVED</b>	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
<b>CUSTOMER</b>	
<b>RECEIVED DATE</b>	: 12 Sep 2024
<b>MEASUREMENT DATE</b>	: 18 Sep 2024
<b>ISSUE DATE</b>	: 01 Oct 2024

<b>ENVIRONMENTAL CONDITIONS:</b>	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

<b>PLACE OF CALIBRATION</b>	: Effel-type wind tunnel of Jiranatee Associates Co., Ltd.
-----------------------------	--

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

<b>Preconditioning</b>	: 24 hours at ambient conditions.
<b>Measurement Condition</b>	: The average values during measurement are (24.9) °C, (67.4) %RH and (1009.5) hPa.

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

Calibrated by:  
U/ Mr. Supot Salameh  
J/ Miss Jiraporn Lertprachit



Approved signature:  
Mr. Pinyan Booncharoen  
Calibration Department Manager

REVIEW BY:   
APPROVED BY:   
NEXT CAL DATE: 18 Mar 2026

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-TIS-TIS 17025  
CALIBRATION 0367

Wind direction measurement laboratory  
Calibration services department.



NSC - TIS - TIS 17025  
CALIBRATION 0367

Certificate Number

CWD-046-67

## CERTIFICATE OF CALIBRATION

<b>MEASUREMENT ITEM</b>	: Wind Direction Sensor
<b>MANUFACTURER</b>	: Novallux
<b>MODEL/TYPE</b>	: Sensor: WS-02FA Data logger: 11B-WS-250L-D
<b>SERIAL NUMBER</b>	: Sensor: WSD-A6069 Data logger: A6069 RYG_FS0724
<b>ID NUMBER</b>	: New Item
<b>CONDITION AS RECEIVED</b>	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
<b>CUSTOMER</b>	
<b>RECEIVED DATE</b>	: 12 Sep 2024
<b>MEASUREMENT DATE</b>	: 18 Sep 2024
<b>ISSUE DATE</b>	: 01 Oct 2024

<b>ENVIRONMENTAL CONDITIONS:</b>	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

<b>PLACE OF CALIBRATION</b>	: Effel-type wind tunnel of Jiranatee Associates Co., Ltd.
-----------------------------	--

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

<b>Preconditioning</b>	: 24 hours at ambient conditions.
<b>Measurement Condition</b>	: The average values during measurement are (22.9) °C, (52.1) %RH and (1000.5) hPa.

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

Calibrated by:  
U/ Mr. Supot Salameh  
J/ Miss Jiraporn Lertprachit



Approved signature:  
Mr. Pinyan Booncharoen  
Calibration Department Manager

REVIEW BY:   
APPROVED BY:   
NEXT CAL DATE: 18 Mar 2026

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



### MEASUREMENT RESULTS<sup>5</sup>

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 <sup>°</sup> <sub>std</sub> Degree (°)	D <sup>°</sup> <sub>me</sub> Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.02	45.000	42	-3	0.80
	90.000	87	-3	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	319	4	0.80
	360.000	359	-1	0.80

#### Remark:

<sup>5</sup> Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

<sup>6</sup> Direction of standard

<sup>7</sup> Direction of Unit Under Calibration

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



JIRANATEE ASSOCIATES CO., LTD.

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CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department.



NSC - TIS - TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : CDT-172-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor  
MANUFACTURER : Novolynx  
MODEL/TYPE : 110-WS-25DL-D  
SERIAL NUMBER : A6069  
ID NUMBER : RYG\_F50724  
CONDITION AS-RECEIVED : New Item  
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan Rd, Phatthanakan Rd,  
Khaeng Suan Luang, Khet Suan Luang,  
Bangkok 10250 Thailand.

RECEIVED DATE : 12 Sep 2024  
MEASUREMENT DATE : 14 Sep 2024  
ISSUE DATE : 01 Oct 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.

#### Calibration procedure:

The temperature calibration was done by the House calibration method by WP41-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was used 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: IT-0047-24, Certificate number: IT-0101-23

#### Reference Used During Calibration:

3. Standard Temperature Probe  
Model: STS-100 ASD, Serial No.: 66782-09,  
Due date: 30 Mar 2025  
2. Digital Temperature Indicator  
Model: D31-1000-A ME II, Serial No.: 3674029-00551 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.



Approved signature:

Mr. Parinya Booncharoen  
Calibration Department Manager

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IN WRITING FROM THE LABORATORY



JIRANATEE ASSOCIATES CO., LTD.

Continuation of Certificate of Calibration Number CDT-172-67

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

#### Function:

Table 3: This equipment was connected with temperature sensor Model: HMP605/N: W2920792.  
Dimension: Diameter 12 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.061	19.9	-0.2	0.099
80	25.054	24.8	-0.3	0.099
80	30.040	29.8	-0.2	0.099
80	35.028	34.8	-0.2	0.099
80	40.025	39.8	-0.2	0.099

UUC\*: Unit Under Calibration.

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



JIRANATEE ASSOCIATES CO., LTD.

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

Relative humidity and Air Temperature measurement laboratory  
Calibration services department.

## CERTIFICATE OF CALIBRATION

Certificate No. : CRT-041-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger  
MANUFACTURER : Novolynx  
MODEL/TYPE : Data Logger: 110-WS-25DL-D  
Sensor: HMP60  
SERIAL NUMBER : Data Logger: A6069  
Sensor: W2920792  
ID NUMBER : RYG\_F50724  
CONDITION AS-RECEIVED : New Item  
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan Rd, Phatthanakan Rd, Khaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 12 Sep 2024  
MEASUREMENT DATE : 18 Sep 2024  
ISSUE DATE : 01 Oct 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.

#### Calibration procedure:

The relative humidity and Air Temperature calibration was done by the House calibration method as W41-002 and W41-003 according to comparison method with Standard, Calibrated Meter hygrometer with Temperature sensor and standard humidity generator (chamber).

#### Traceability:

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: IT-0047-24 and through Jiranatee Associates Co., Ltd. Certificate number: CDT-001-67.

#### 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.



Approved signature:

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

Continuation of Certificate of Calibration Number: CRT-041-67

Page 2 of 2 Pages

**Measurement Results:**

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 1: The results of calibration of relative humidity at 30 °C are reported in table below.  
Calibration Range: 20%RH to 80%RH

Air Temperature (°C)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty (%RH)
29.82	19.50	17.3	-2.2	0.85
29.83	50.85	47.8	-3.0	1.4
29.84	81.59	77.2	-4.4	2.3

UUC: Unit Under Calibration

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



JIRANATEE ASSOCIATES CO.,LTD.

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Accredited calibration laboratory

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NSC-TISI-TIS 17025  
CALIBRATION 0367

Pressure measurement laboratory

Calibration services department.



**CERTIFICATE OF CALIBRATION**

Certificate No. : CFB-019-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Digital barometer  
MANUFACTURER : Novalyx  
MODEL/TYPE : Sensor: 110-WS-250P  
Data logger: 110-WS-250L-D  
SERIAL NUMBER : Sensor: BP-A6069  
Data logger: A6069  
ID NUMBER : RYG\_F50224  
CONDITION AS-RECEIVED : New Item  
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan Rd, Phatthanakan Rd,  
Khaeng Suan Luang, Khet Suan Luang,  
Bangkok 10250 Thailand.

RECEIVED DATE : 12 Sep 2024  
MEASUREMENT DATE : 26 Sep 2024  
ISSUE DATE : 01 Oct 2024

Calibration procedure:  
The digital barometer was calibrated against  
Digital pressure calibrator, The JN C-003  
was used as a calibration guide line.

Traceability:  
The measurement results are traceable to  
the international system of units (SI) through  
the NIMT (National Metrology Institute of  
Thailand) as Certificate number: MP-0029-24

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.	Issue Date
Absolute Pressure Transducer	CPG2500	31001269	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:
  - Pressure transmitting medium: ☒ Normal ☐ Abnormal
  - Fluid: Air
  - Pressure (kPa): 110 (250P)
  - Temperature (°C): 25 (250L)
  - Humidity: 50% RH
  - Power: 100 (110)
5. The certificate is valid only for the time calibrated on date and place of calibration

Calibrated by:  
☒ Mr. Soravit Thecharat  
☐ Ms. Jiraporn Lertsoonthol



Approved signatory:  
Mr. Panyia Boonchareon  
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

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Accredited calibration laboratory  
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NSC-TISI-TIS 17025  
CALIBRATION 0367

Pressure measurement laboratory  
Calibration services department.



**CERTIFICATE OF CALIBRATION**

Certificate No. : CFB-019-67

Page 2 of 2 Pages

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 (k92) (mbar)
950.06	950.8	0.7	0.37
970.05	970.7	0.6	0.37
990.05	990.5	0.4	0.37
1010.04	1010.0	0.0	0.37
1030.02	1029.8	-0.2	0.37
1050.02	1049.7	-0.3	0.37

Note: UUC\* Unit Under Calibration

To convert the result in report unit to Pa should be multiply by 100

\*End of certificate\*



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Accredited calibration laboratory

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

Air speed measurement laboratory

Calibration services department.



Certificate Number  
CVS-004-68

**CERTIFICATE OF CALIBRATION**

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer  
MANUFACTURER : Novalyx  
MODEL/TYPE : Sensor: WS-02FA  
Data logger: 110-WS-250L-D  
SERIAL NUMBER : Sensor: WS0-A5977  
Data logger: A5977  
ID NUMBER : RYG\_F50647  
CONDITION AS-RECEIVED : Used Item  
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan Rd, Phatthanakan Rd,  
Khaeng Suan Luang, Khet Suan Luang,  
Bangkok 10250 Thailand.

RECEIVED DATE : 10 Jan 2025  
MEASUREMENT DATE : 15 Jan 2025  
ISSUE DATE : 20 Jan 2025

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<sup>1</sup> : 900 cm<sup>2</sup>  
Wind direction frontal area<sup>2</sup> : 100 cm<sup>2</sup>  
Diameter of mounting pipe : - mm  
Blockage ratio of test object<sup>3</sup> : 0.111 [-]

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : (The average values during measurement are (24.1) °C, (54.2) %RH and (1016.4) hPa.

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

Calibrated by:  
☒ Mr. Soravit Thecharat  
☐ Ms. Jiraporn Lertsoonthol



Approved signatory:  
Mr. Panyia Boonchareon  
Calibration Department Manager

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

REVIEW BY :   
APPROVED BY :   
NEXT CAL DATE : 14/ 07/ 26

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

CVI-004-68

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>1</sup>

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 30 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.

$v_{ref}$ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	$v_{ref}$ (m/s)	Error (m/s)	U (k=2) (m/s)
0.990	24.10	24.05	0.9	-0.1	0.45
2.203	24.20	24.05	2.1	-0.1	0.31
3.010	24.10	24.05	2.9	-0.1	0.55
4.200	24.10	24.05	4.1	-0.1	0.31
4.95	24.20	24.05	5.0	0.1	0.68
5.97	24.10	24.05	5.9	-0.1	0.36
7.03	24.20	24.05	6.9	-0.1	0.43
7.96	24.10	24.05	7.9	-0.1	0.63
9.01	24.10	24.05	9.0	-0.1	0.54
9.95	24.10	24.05	9.9	-0.1	0.66
11.06	24.00	24.05	10.9	-0.2	0.71
11.99	24.10	24.05	11.8	-0.2	0.63
13.03	24.04	24.05	13.0	0.0	0.89
13.95	24.30	24.05	14.0	0.0	0.83
15.02	24.12	24.05	14.9	-0.1	0.69
15.95	24.26	24.05	15.9	0.0	0.71

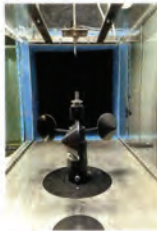
## Remark:

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

<sup>2</sup> Velocity of standard

<sup>3</sup> 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 (sky blue) is the calibrated one. Remark: The perspective of the set-up is not necessarily due to testing geometry.



Certificate Number

CVI-004-68

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>1</sup>

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 <sup>1</sup> <sub>ref</sub> Degree (°)	D <sup>2</sup> <sub>ref</sub> Degree (°)	Error Degree (°)	U (k=2) Degree (°)
	0.000	0	0	0.80
	45.000	41	-4	0.80
	90.000	87	-3	0.80
4.99	135.000	131	-4	0.80
	180.000	177	-3	0.80
	225.000	225	0	0.80
	270.000	274	4	0.80
	315.000	319	4	0.80

## Remark:

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

<sup>2</sup> Direction of standard

<sup>3</sup> Direction of Unit Under Calibration

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



JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.  
80/24-15, 8/259-36,  
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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

CVI-004-68

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

## MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

## ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature

Relative Humidity

Atmospheric Pressure

## PLACE OF CALIBRATION

## CALIBRATION CONDITION

Wind tunnel cross-section area<sup>1</sup>Wind direction frontal area<sup>2</sup>Diameter of mounting pipe<sup>3</sup>Blockage ratio of test object<sup>4</sup>

## Preconditioning

Measurement Condition

## TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

② Mr. Sornrat Thachalad

③ Miss Jitraporn Lertsomphol



Approved signature:

Mr. Parinya Booncharoen  
Calibration Department Manager

## Remark:

<sup>1</sup> Net cross-section area of the wind tunnel.

<sup>2</sup> Projected cross-section area of the tested object include mounting pipe

<sup>3</sup> Diameter of mounting pipe

<sup>4</sup> Ratio:  $\frac{A_o}{A_n}$

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.

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-028-68

Page 1 of 2 Pages

## MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

## ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature

Relative Humidity

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.



Calibrated by:

② Mr. Sornrat Thachalad

③ Miss Jitraporn Lertsomphol

④ Miss Ruangrump Poommit

Approved signature:

Mr. Parinya Booncharoen  
Calibration Department Manager

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Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

**Function:**

Table 1: This equipment was connected with temperature sensor Model: HMP60 S/N: V1920212.  
Dimension: Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.077	19.8	-0.3	0.099
80	25.066	24.8	-0.3	0.099
80	30.053	29.8	-0.3	0.099
80	35.034	34.7	-0.3	0.099
80	40.019	39.7	-0.3	0.099

UUC\*: Unit Under Calibration

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



Jiranatee Associates Co., Ltd.  
43/24-15, 43/25-38  
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Tel: +662 0880812  
Mobile: +662 0810453  
E-mail: jnac-calibration@jiranatee.com  
Web site: www.jiranatee.com

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

Relative humidity and Air Temperature measurement laboratory  
Calibration services department.



**CERTIFICATE OF CALIBRATION**

Certificate No.: CRT-002-68

Page 1 of 2 Pages

**MEASUREMENT ITEM**

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Relative humidity with data logger

Novalyx

Data Logger: 110-WS-250L-D

Sensor: HMP60

Data Logger: AS977

Sensor: V1920212

RYG, F50647

Used item

ALS laboratory group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,

Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

10 Jan 2025

15 Jan 2025

20 Jan 2025

**ENVIRONMENTAL CONDITIONS:**

Ambient condition in the laboratory are as follow:

Temperature: 23.0 ± 0.0 °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.



Calibrated by:  
1) Mr. Sorapong Thachalad  
2) Mr. Jiraporn Lertsamphol  
3) Mr. Jiraporn Lertsamphol

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.

**Measurement Results:**

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 1: The results of calibration of relative humidity at 30 °C are reported in table below  
Calibration Range: 20%RH to 80%RH

Air Temperature (°C)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty ± (%RH)
29.72	19.84	18.6	-1.3	0.78
29.73	51.26	49.0	-2.3	1.1
29.74	82.85	79.7	-3.2	2.1

UUC\*: Unit Under Calibration

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



Jiranatee Associates Co., Ltd.  
43/24-15, 43/25-38  
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Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC-TIS-TIS 17025  
CALIBRATION 0367

Pressure measurement laboratory  
Calibration services department.



**CERTIFICATE OF CALIBRATION**

Certificate No.: CPA-002-68

Page 1 of 2 Pages

**MEASUREMENT ITEM**

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Digital barometer

Novalyx

Sensor: 110-WS-258P

Data logger: 110-WS-25DL-D

Sensor: BP-AS977

Data logger: AS977

RYG, F50647

Used item

ALS laboratory group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd,

Khwaeng Suan Luang, Khet Suan Luang,

Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

10 Jan 2025

15 Jan 2025

20 Jan 2025

**Calibration procedure:**

The Digital barometer was calibrated against Digital pressure calibrator, The WI-CL007 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) Certificate Number: MP-0009-24

Reference Used During Calibration:  
1. Absolute Pressure Transducer  
Model: ENG2000, Serial No.: 4100126P

**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 JGIM Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

**CONDITION OF THIS RESULT OF CALIBRATION:**

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
  - $P_{ref}$  (20°C, 1 bar): 1.19 kg/m<sup>3</sup>
  - $T_{ref}$ : (62.4 ± 0.2) °C
  - $T_{amb}$ : (23.540 ± 0.1) °C
  - $P_{amb}$ : (1011.0 ± 1.6) mbar
5. The certificate is valid only to the item calibrated on date and place of calibration



Calibrated by:  
1) Mr. Sorapong Thachalad  
2) Mr. Jiraporn Lertsamphol

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.

## CERTIFICATE OF CALIBRATION

Certificate No.: C/PB-032-68

Page 2 of 2 Pages

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)
950.02	951.4	1.4	0.37
970.08	971.3	1.2	0.38
990.07	990.8	0.8	0.38
1010.07	1010.4	0.3	0.38
1030.02	1029.9	-0.1	0.37
1050.08	1049.5	-0.6	0.37

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

\*End of certificate\*



## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com

SITHIPORN  
associates



Cert. No.: ACC24054

Pages: 1 of 3

## Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No.: 34178123  
ID No.: RYG\_FS0215

REVIEW BY: *[Signature]*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 22-Oct-25

Condition As Found : GOOD

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

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

Received Date : 18 OCTOBER 2024  
Calibration Date : 22 OCTOBER 2024  
Date of Issue : 24 OCTOBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : *[Signature]*  
( 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

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No.: ACC24054  
Job No.: VC68AC0015  
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-42KAI	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V744B6069	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).

*[Signature]*

## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No.: ACC24054  
Job No.: VC68AC0015  
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	94.09	0.09	0.14	0.40

#### 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.5	0.1	0.1	1.0

#### 3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.55	0.10	3.0

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

End of Calibration Certificate

*[Signature]*



Cert. No. : ACL25071  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42 / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 01122579 / 172172 / 74022  
**ID No.:** RYG\_FS0018

**Condition As Found :** GOOD

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

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

**Received Date :** 07 JANUARY 2025  
**Calibration Date :** 21 - 23 JANUARY 2025  
**Date of Issue :** 24 JANUARY 2025

**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.

Cert. No. : ACL25071  
Job No. : VC68AC0059  
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. : ACL25071  
Job No. : VC68AC0059  
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. : ACL25071  
Job No. : VC68AC0059  
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)
14.8

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

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.3
Flat	24.0

#### 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.1	0.1	0.1	±1.0
8000	1.1	1.1	1.1	±5.0

Cert. No. : ACL25071  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

T. Petch

Cert. No. : ACL25071  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.1	0.1	± 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	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	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	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

## 11. Overload indication

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

## 12. High level stability

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

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$ 

or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch



Cert. No. : ACL25080  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25  
Serial No. : 00920831 / 22191 / 22220  
ID No. : RYG\_FS0622

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

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. : ACL25080  
Job No. : VC68AC0059  
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. : ACL25080  
Job No. : VC68AC0059  
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. : ACL25080  
Job No. : VC68AC0059  
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)	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 ( dB )	Weighting ( dB )
A - weight	8.7
C - weight	13.7
Flat	19.3

## 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	0.4	0.4	0.4	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.6	0.6	0.6	+ 1.5, - 2.5

Cert. No. : ACL25080  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.1	0.1	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	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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Cert. No. : ACL25080  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	25.0	0.0	±0.8

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Cert. No. : ACL25080  
Job No. : VC68AC0059  
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	±0.8

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	28.9	-0.1	±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	128.0	0.0	±0.5

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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	±2.0
One	133.4	133.3	-0.1	±2.0

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

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

Z. Petch



Cert. No. : ACL25082  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-52A / Microphone UC-59 / Preamplifier NII-25  
Serial No.: 01120937 / 21845 / 22326  
ID No.: RYG\_FS0628

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*(Signature)*  
( 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. : ACL25082  
Job No. : VC68AC0059  
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. : ACL25082  
Job No. : VC68AC0059  
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. : ACL25082  
Job No. : VC68AC0059  
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)	94.0	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
13.8

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

Frequency Weighting ( dB )	Weighting ( dB )
A - weight	10.8
C - weight	14.2
Flat	19.8

## 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	0.3	0.3	0.3	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.4	0.4	0.4	+ 1.5, - 2.5

Cert. No. : ACL25082  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

Cert. No. : ACL25082  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	132.9	-0.1	±0.8
132.0	131.9	-0.1	±0.8
131.0	130.9	-0.1	±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	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.1	0.1	±0.8

Cert. No. : ACL25082  
Job No. : VC68AC0059  
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	±0.8

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

Cert. No. : ACL25082  
Job No. : VC68AC0059  
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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±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

## 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	±0.1

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

End of Calibration Certificate



Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Certificate No : 25-ACT-010

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

Request No : Req-2025-0091

Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Class : 1

Manufacturer : RION

Range : 94 dB / 1000 Hz

Model : NC-74

Instrument Status : Used

Serial Number : 34178121

ID : RYG\_FS0213

Calibration Environment and Details

Temperature : ( 23 ±2 °C )

Humidity : ( 50 ± 20 %RH )

Barometric Pressure : ( 1013 ±10.0 hPa )

Received Date : 15 January 2025

Calibration Date : 16 January 2025

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

REVIEW BY : 

APPROVED BY : 

NEXT CAL DATE : 16/01/26

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EET	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

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 Mathavorn  
Calibration Engineer Supervisor

Issue Date : 16 January 2025

Certificate No : 25-ACT-010

Request No : Req-2025-0091

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty ( ± dB )	Acceptance limit Class 1 ( ± dB )	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94,11	0.11	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty ( ± % )	Acceptance limit Class 1 ( ± % )	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty ( ± % )	Acceptance limit Class 1 ( ± % )	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	1.21	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

Certificate No : 25-ACT-010  
Request No : Req-2025-0091

Decision Rule for Statements of Conformity

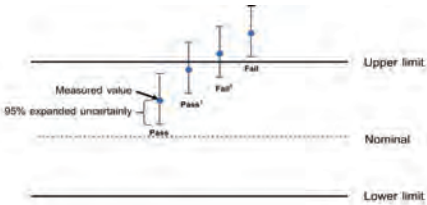
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass<sup>1</sup> – The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail<sup>1</sup> – 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 Calibration

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

451-451/1 Sirthiporn Road, Bangbunmi, Bangkok, Bangkok, 10700 Thailand  
Tel : +66 2433 8331 Email : calibration@sithiporn.com



Cert. No. : ACL24282  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER

Manufacturer : RION

Model : NL-42 / Microphone UC-52 / Preamplifier NH-24

Serial No.: 01122567 / 143473 / 22605

ID No.: RYG\_FS0016

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 SEPTEMBER 2024

Calibration Date : 19 SEPTEMBER 2024

Date of Issue : 20 SEPTEMBER 2024

REVIEW BY : 

APPROVED BY : 

NEXT CAL DATE : 19/9/25

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. : ACL24282  
Job No. : VC67AC0148  
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*

Cert. No. : ACL24282  
Job No. : VC67AC0148  
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 )
15.4

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

Frequency Weighting	Weighting ( dB )
A - weight	12.0
C - weight	18.4
Flat	24.1

##### 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-2.4	-2.4	-2.4	±5.0

*T. Petch*

Cert. No. : ACL24282  
Job No. : VC67AC0148  
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. : ACL24282  
Job No. : VC67AC0148  
Pages : 5 of 8

#### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	-0.1	-0.1	±1.5
250	-0.1	0.0	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

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

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

*T. Petch*



Cert. No. : ACL24282  
Job No. : VC67AC0148  
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	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	28.9	-0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	24.8	-0.2	±1.1

T. Petchur

Cert. No. : ACL24282  
Job No. : VC67AC0148  
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	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
SEL	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

T. Petchur

Cert. No. : ACL24282  
Job No. : VC67AC0148  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±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		
89.6	89.6	0.0	±1.5

## 12. High level stability

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

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

End of Calibration Certificate

T. Petchur

Cert. No. : ACL25073  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01222716 / 143832 / 22763  
ID No. : RYG\_FS0020

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchur  
( 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. : ACL25073  
Job No. : VC68AC0059  
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*

Cert. No. : ACL25073  
Job No. : VC68AC0059  
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. : ACL25073  
Job No. : VC68AC0059  
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)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	16.7
Flat	22.6

##### 3. Acoustical signal tests of frequency weightings

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

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

*T. Petch*

Cert. No. : ACL25073  
Job No. : VC68AC0059  
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	0.2	0.2	0.3	±2.0
125	0.2	0.2	0.2	±1.5
250	0.1	0.1	0.1	±1.5
500	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.1	±1.0
2000	0.0	0.0	0.0	±2.0
4000	-0.1	-0.1	0.0	±3.0
8000	-0.1	0.0	0.0	±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

*T. Petch*



Cert. No. : ACL25073  
Job No. : VC68AC0059  
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	140.0	3.0	± 1.1
136.0	140.0	4.0	± 1.1
135.0	140.0	5.0	± 1.1
134.0	140.0	6.0	± 1.1
133.0	133.1	0.1	± 1.1
132.0	132.1	0.1	± 1.1
131.0	131.1	0.1	± 1.1
129.0	129.1	0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.2	0.2	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.3	0.3	± 1.1

T. Petchur

Cert. No. : ACL25073  
Job No. : VC68AC0059  
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	29.0	29.2	0.2	±1.1

## 9. Tone burst response

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

T. Petchur

Cert. No. : ACL25073  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±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		
89.6	89.5	-0.1	±1.5

## 12. High level stability

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

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

End of Calibration Certificate

T. Petchur

451-451/ Sirinthon Road, Bangbunru, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.com

Cert. No. : ACL25074  
Job No. : VC68AC0059  
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).

7. Petch.

Cert. No. : ACL25074  
Job No. : VC68AC0059  
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

7. Petch.

Cert. No. : ACL25074  
Job No. : VC68AC0059  
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)
18.2

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

Frequency Weighting	Weighting (dB)
A - weight	13.1
C - weight	19.2
Flat	24.9

## 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	0.7	0.7	0.7	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.0	0.0	0.0	± 5.0

7. Petch.

Cert. No. : ACL25074  
Job No. : VC68AC0059  
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	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±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

7. Petch.



Cert. No. : ACL25074  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.1	0.1	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

T. Petchurai

Cert. No. : ACL25074  
Job No. : VC68AC0059  
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	29.0	29.1	0.1	±1.1

## 9. Tone burst response

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

T. Petchurai

Cert. No. : ACL25074  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

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

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

T. Petchurai

451-451/ Sirinthon Road, Bangbunru, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email: calibration@sithiporn.comCert. No. : ACL25075  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00233184 / 144837 / 23232  
ID No. : RYG\_FS0025

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

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.

Cert. No. : ACL25075  
Job No. : VC68AC0059  
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).

*Signature*

Cert. No. : ACL25075  
Job No. : VC68AC0059  
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

*Signature*

Cert. No. : ACL25075  
Job No. : VC68AC0059  
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)
18.2

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

Frequency Weighting	Weighting (dB)
A - weight	11.6
C - weight	17.8
Flat	23.5

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.4	-0.4	-0.4	±5.0

*Signature*

Cert. No. : ACL25075  
Job No. : VC68AC0059  
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	94.0	0.0	± 0.3

*Signature*



Cert. No. : ACL25075  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.1	0.1	± 1.1

T. Petchur

Cert. No. : ACL25075  
Job No. : VC68AC0059  
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	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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

T. Petchur

Cert. No. : ACL25075  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

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

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

T. Petchur

451-451/1 Srinthorn Road, Bangbunru, Bangkok, 10700 Thailand  
Tel. +66 2433 8331 Email : calibration@sithiporn.comCert. No. : ACL25076  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00734221 / 187363 / 23230  
ID No.: RYG\_FS0027

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced  
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Cert. No. : ACL25076  
Job No. : VC68AC0059  
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).

*S. Petch.*

Cert. No. : ACL25076  
Job No. : VC68AC0059  
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#### 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

*S. Petch.*

Cert. No. : ACL25076  
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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)	93.9	0.0	±0.3

##### 2. Self-generated noise

###### 2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	17.9
Flat	23.8

##### 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	2.1	2.1	2.1	±5.0

*S. Petch.*

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Job No. : VC68AC0059  
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	0.0	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
Lcq	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

*S. Petch.*



Cert. No. : ACL25076  
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## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 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	28.9	-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	134.1	0.1	+1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	+1.0

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Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

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

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

T. Petchum

Cert. No. : ACL24228  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00734223 / 169439 / 72460  
ID No.: RYG\_FS0029

Condition As Found : GOOD

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

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

Received Date : 10 JULY 2024  
Calibration Date : 11 JULY 2024  
Date of Issue : 15 JULY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchum  
( Thanakul Petchum )

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Cert. No. : ACL24228  
Job No. : VC67AC0127  
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*

Cert. No. : ACL24228  
Job No. : VC67AC0127  
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	-	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. : ACL24228  
Job No. : VC67AC0127  
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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)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	16.7
Flat	22.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.7	-1.6	-1.6	±5.0

*T. Petch*

Cert. No. : ACL24228  
Job No. : VC67AC0127  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

*T. Petch*



Cert. No. : ACL24228  
Job No. : VC67AC0127  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.1	0.1	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

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Cert. No. : ACL24228  
Job No. : VC67AC0127  
Pages : 7 of 8

## 8. Level linearity including the level range control

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

## 9. Tone burst response

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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±3.0

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

T. Petch

Cert. No. : ACL24228  
Job No. : VC67AC0127  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

T. Petch

Cert. No. : ACL24266  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00734218 / 146937 / 34368  
ID No. : RYG\_FS0031

Condition As Found : GOOD

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

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

Received Date : 09 AUGUST 2024  
Calibration Date : 30 AUGUST 2024  
Date of Issue : 03 SEPTEMBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petch  
( Thanakul Petchurai )

REVIEW BY	Nathakorn P
APPROVED BY	T. Petch
NEXT CAL DATE	30/9/25

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Cert. No. : ACL24266  
Job No. : VC67AC0140  
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-42KAJ	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*

Cert. No. : ACL24266  
Job No. : VC67AC0140  
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. : ACL24266  
Job No. : VC67AC0140  
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)
19.5

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

Frequency Weighting	Weighting (dB)
A - weight	11.6
C - weight	17.6
Flat	23.3

##### 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.6	0.6	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.1	-1.1	-1.1	± 5.0

*T. Petch*

Cert. No. : ACL24266  
Job No. : VC67AC0140  
Pages : 5 of 8

##### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

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

###### 5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

*T. Petch*



Cert. No. : ACL24266  
Job No. : VC67AC0140  
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	30.0	0.0	±1.1
29.0	29.1	0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

Z. Petch-

Cert. No. : ACL24266  
Job No. : VC67AC0140  
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	29.8	-0.2	±1.1

## 9. Tone burst response

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

Z. Petch-

Cert. No. : ACL24266  
Job No. : VC67AC0140  
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	136.4	0.0	±3.0

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

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

Z. Petch-

## CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc  
DATE OF ISSUE: 02 December 2024  
CERTIFICATE NUMBER: 228072Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Approved signatory  
N.Smith  
Electronically signed:

[Signature]

## doseBadge Reader : IEC 60942:2003

## Instrument information

Manufacturer: Cirrus Research plc  
Model: RC:110A  
Serial number: 75996  
Class: 2

## Notes:

## Test summary

Date of calibration: 02 December 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 MK224 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:

REVIEW BY: [Signature]

APPROVED BY: [Signature]

NEXT CAL DATE: 02/12/25

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

# CERTIFICATE OF CALIBRATION

Certificate Number:

228072

Page 2 of 2

## Environmental conditions

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

Before Pressure: 100.23 kPa Temperature: 23.0 °C Humidity: 39.1 %  
After Pressure: 100.24 kPa Temperature: 23.0 °C Humidity: 41.3 %

## Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1053426
Acoustic Calibrator	Brüel and Kjær	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	113.20	113.19	113.19	113.19	-0.81	±0.75	0.11 dB
Distortion (%)	< 4.00	0.23	0.21	1.39	0.61	0.61	+4.00	0.13 %
Frequency (Hz)	1000.0	1004.1	1004.1	1004.1	1004.1	4.1	±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	0.23	0.25	0.23	0.24	0.24	+4.00	0.13 %
Frequency (Hz)	1000.0	1004.0	1004.1	1004.1	1004.1	4.1	±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



Jiranatee Associates Co., Ltd  
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E-mail: jiracal@jiranatee.com  
Web site: www.jiranatee.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
ASC 170-175 17025  
CALIBRATION 0367

Acoustic calibration laboratory  
Calibration services department.

REVIEW BY

APPROVED BY

NEXT CAL. DATE 19/1/26

Calibration report Number

CDM-104 67

# CALIBRATION REPORT

Page 1 of 1 Pages

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

Dose meter  
Cirrus Research plc  
RC-110A1S  
YF472  
RVG\_F50033  
Used item  
ALS laboratory group (Thailand) Co., Ltd.  
104 Phattana Road, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

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 standards, and to realization of the international system of units (SI) through Cirrus research plc via Certificate number: 218610

RECEIVED DATE  
MEASUREMENT DATE  
ISSUE DATE

16 Sep 2024  
17 Sep 2024  
18 Sep 2024

## ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:  
Temperature  
Relative Humidity  
Atmospheric Pressure

23.0 ± 3.0 °C  
55.0 ± 15.0 %RH  
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.

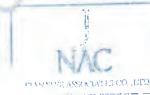
## CALIBRATION RESULTS:

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

DoseBadge Reader Level (dB)	Noise Dosimeter reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

## Calibrated by:

Mr. Sorawit Thachalad  
Miss Jitraporn Uertsomphol



## Approved signatory:

Mr. Parinya Booncharoen  
Calibration Department Manager

## Remark:

The decibel level of standard dosebadge reader that supplied to Unit Under Calibration.  
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

# CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research

DATE OF ISSUE 13 February 2025

CERTIFICATE NUMBER 232797

Page 1 of 2

Approved signatory

R.Thomas

Electronically signed:

R.Thomas

## doseBadge Reader : IEC 60942:2003

## Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC-110A

Serial number: 73729

Class: 2

## Test summary

Date of calibration: 12 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:

REVIEW BY  
APPROVED BY  
NEXT CAL DATE: 11/02/2026

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

# CERTIFICATE OF CALIBRATION

Certificate Number:

232797

Page 2 of 2

## Environmental conditions

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

Before Pressure: 101.42 kPa Temperature: 25.1 °C Humidity: 33.1 %  
After Pressure: 101.42 kPa Temperature: 25.2 °C Humidity: 35.9 %

## Test equipment

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

## Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	112.51	112.45	112.61	112.52	-1.48	±0.75	0.11 dB
Distortion (%)	< 4.00	1.46	1.70	2.01	1.72	1.72	+4.00	0.13 %
Frequency (Hz)	1000.0	998.2	998.2	998.2	998.2	-1.8	±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.

## Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.00	113.99	114.01	114.00	0.00	±0.75	0.11 dB
Distortion (%)	< 4.00	0.97	0.96	0.95	0.96	0.96	+4.00	0.13 %
Frequency (Hz)	1000.0	998.1	998.1	998.1	998.1	-1.9	±20.0	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



## CALIBRATION REPORT

Page 1 of 1 Pages

### MEASUREMENT ITEM

: Dose meter

### MANUFACTURER

: Cirrus Research plc

### MODEL/TYPE

: CR120A15

### SERIAL NUMBER

: Y7476

### ID NUMBER

: RYG\_F50039

### CONDITION AS-RECEIVED

: Used item

### CUSTOMER

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

### RECEIVED DATE

: 16 Sep 2024

### MEASUREMENT DATE

: 17 Sep 2024

### ISSUE DATE

: 18 Sep 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

### PRECONDITIONING

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

### 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 6042:2003 where applicable.

### 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 Cirrus research plc via Certificate number: 218610

### STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc Model: RC110A 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 (dB)	Noise Dosimeter reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:  
[X] Mr. Sorawit Thachalad  
[X] Miss Jitraporn Ertsoisombo



Approved signatory

Mr. Parinya Booncharoen  
Calibration Department Manager

### Remark:

\* The declared level of standard dosebadge reader that supplied to Unit Under Calibration.

\* 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

## Certificate of Calibration

Certificate No : 24-AFM-033

Request No : Req-2024-0241

### Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

### Address

: 104 Soi Phattharakarn 40, Phattharakarn Road, Suan Luang, Bangkok

10250

### Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : Bios

Model : Defender 510-L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG\_F50208

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 : 31 January 2024

Calibration Date : 13 February 2024

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

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	080000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

### Traceability :

This Certificate is traceable to SI Unit through Sensidyne AZLA 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 :

*[Signature]*  
Mr. Noppadon Luangart  
Service Calibration Engineer

### Approved By :

*[Signature]*  
Mr. Puchit Mathavom  
Calibration Engineer Supervisor

Issue Date : 13 February 2024

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 01 issue date 25/01/24

Certificate No : 24-AFM-033

Request No : Req-2024-0241

### Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

### 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 :

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

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

\* Indicates non accredited

End of Certificate

## Calibration Certificate

Certificate No. 610563

Sold To:

Product 200-510M Defender 510 Medium Flow

Serial No. 151114

Cal. Date 21-May-2024

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

### As Received Calibration Data

Technician	Derek Deltape	Lab. Pressure	614.2 mmHg
		Lab. Temperature	24.3 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
0 ccm	4504.81 ccm	-100.0%	1.00%
0 ccm	1000.98 ccm	-100.0%	1.00%
0 ccm	249.55 ccm	-100.0%	1.00%
			As Received
			Out of Tolerance
			Out of Tolerance
			Out of Tolerance

### Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	13-Nov-2023	13-Nov-2024



### As Shipped Calibration Data

Certificate No Technician	610563 Derek Dellape	Lab. Pressure Lab. Temperature	617 mmHg 24.6 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
4482.47 ccm	4493.49 ccm	-0.25%	1.00%
997.25 ccm	996.83 ccm	0.04%	1.00%
248.51 ccm	248.67 ccm	-0.06%	1.00%
As Shipped		In Tolerance	
		In Tolerance	

### Mesa Laboratories Standards Used

Description ML-800-24	Standard Serial Number 211063	Calibration Date 04-Oct-2023	Calibration Due Date 04-Oct-2024
--------------------------	----------------------------------	---------------------------------	-------------------------------------

#### Calibration Notes

The expanded uncertainty of flow has a coverage factor of k = 2 for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200681-0.

#### Technician Notes:

By:

Approved By:

*Troy Thacker*

Derek Dellape  
Production Assembler II

Troy Thacker  
Quality Engineer

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibrations process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

Mesa Laboratories Inc. 12100 W 6th Ave, Lakewood, CO 80228 USA  
(303) 987-6000 www.mesalabs.com Symbol "MLAB" on the NASDAQ

2 of 2

FM-00228 Rev. B



### Air Sampling Pump Calibration Report

Air Sampling Pump Detail			
Calibration Date	7 Jan 2025	Next cal.	7 Apr 2025
Air Sampling Pump ID	RYG_FS0111	Barometric (mmHg)	751
Serial No.	20150310160	Temperature ( °C )	25.0

Reference Standard Low Flow Meter			
Brand	MesaLabs	ID	RYG_FS0208
Model	Defender 510-L	Serial No.	130027
Due Date	13-Aug-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	20.2	20.3	20.2	20.2	21	19	Passed
50	50.1	49.9	50.7	50.2	52.5	47.5	Passed
100	99.7	99.5	99.3	99.5	105	95	Passed
200	200.4	201.1	201.2	200.9	210	190	Passed
500	509.3	508.8	513.6	510.6	515	485	Passed
1000	1009.6	996.2	1006.2	1004.0	1010	990	Passed
2000	2000.8	1996.5	1994.8	1997.4	2020	1980	Passed
2500	2523.7	2519.0	2514.5	2519.1	2550	2450	Passed

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

Calibrated by : *Chanon Booncheun*  
( Mr. Chanon Booncheun )  
Enviro Field Services Scientist (1)

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

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



### Air Sampling Pump Calibration Report

Air Sampling Pump Detail			
Calibration Date	6 Jan 2025	Next cal.	6 Apr 2025
Air Sampling Pump ID	RYG_FS0124	Barometric (mmHg)	755.9
Serial No.	20150310180	Temperature ( °C )	25.9

Reference Standard Low Flow Meter			
Brand	MesaLabs	ID	RYG_FS0208
Model	Defender 510-L	Serial No.	130027
Due Date	13-Aug-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	19.8	19.8	19.7	19.8	21.0	19.0	Passed
50	49.8	50.9	49.6	50.1	52.5	47.5	Passed
100	100.6	100.7	100.9	100.7	105.0	95.0	Passed
200	200.1	200.7	199.2	200.0	210.0	190.0	Passed
500	499.6	500.4	501.1	500.4	515.0	485.0	Passed
1000	1001.8	1008.2	989.8	999.9	1030.0	970.0	Passed
2000	1997.5	1985.1	2000.0	1994.2	2060.0	1940.0	Passed
2500	2513.5	2542.2	2517.1	2524.3	2575.0	2425.0	Passed
4000	4016.5	4018.6	4020.5	4018.5	4120.0	3880.0	Passed

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

Calibrated by : *Nantawat Sarin*  
( Mr. Nantawat Sarin )  
Enviro Field Services Scientist (1)

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

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



### Air Sampling Pump Calibration Report

Air Sampling Pump Detail			
Calibration Date	6 Jan 2025	Next cal.	6 Apr 2025
Air Sampling Pump ID	RYG_FS0139	Barometric (mmHg)	755.9
Serial No.	20150510087	Temperature ( °C )	25.9

Reference Standard Low Flow Meter			
Brand	MesaLabs	ID	RYG_FS0208
Model	Defender 510-L	Serial No.	130027
Due Date	13-Aug-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	20.2	19.8	19.0	19.7	21	19	Passed
50	49.6	49.9	49.6	49.7	52.5	47.5	Passed
100	99.5	99.5	99.6	99.5	105	95	Passed
200	201.5	203.5	202.4	202.5	210	190	Passed
500	498.6	502.9	500.2	500.6	515	485	Passed
1000	1001.8	993.3	1006.9	1000.7	1010	990	Passed
2000	2011.7	2012.9	2009.6	2011.4	2020	1980	Passed
2500	2545.4	2528.4	2528.3	2534.0	2550	2450	Passed

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

Calibrated by : *Nantawat Sarin*  
( Mr. Nantawat Sarin )  
Enviro Field Services Scientist (1)

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

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





## Certificate of Calibration

Certificate No. : C-070425-RYG\_FS0147

### Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump Equipment ID : RYG\_FS0147  
Brand : Gillan Serial No. : 20150910029  
Model/Type : GiAir Plus Calibration Date : 07-Apr-25  
Next calibration date : 07-Jul-25

### Reference Standard Low Flow Meter

Equipment name : Air Flow Meter Equipment ID : RYG\_FS0208  
Brand : MesaLabs Serial No. : 130027  
Model/Type : Defender 510-L Calibration Date : 27-Jan-25  
Due Date : 26-Jan-26

### Reference Standard High Flow Meter

Equipment name : Air Flow Meter Equipment ID : BKK\_FS0614  
Brand : MesaLabs Serial No. : 151114  
Model/Type : Defender 510-M Calibration Date : 9-Sep-24  
Due Date : 9-Sep-25

### Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.9	20.1	20.2	20.4	5%	19 - 21	Passed
50	49.9	50.2	51.2	50.4	5%	48 - 53	Passed
100	100.9	100.7	100.9	100.8	5%	95 - 105	Passed
200	204.1	204.6	204.7	204.5	5%	190 - 210	Passed
High Flow							
500	504.1	505.6	510.1	506.6	3%	485 - 515	Passed
1000	1012.1	1008.2	1012.4	1010.9	3%	970 - 1030	Passed
2000	1990.2	1995.2	1994.8	1993.4	3%	1940 - 2060	Passed
2500	2498.4	2500.2	2494.4	2497.7	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: [Signature]

( Mr.Natchapon Thamklang )

RYG Field Services Scientist (1)

Issue date : 07-Apr-25

Approved By: [Signature]

( Mr.Supot Salamteh )

RYG Field Services Section Head



## Certificate of Calibration

Certificate No. : C-070425-RYG\_FS0158

### Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump Equipment ID : RYG\_FS0158  
Brand : Gillan Serial No. : 20150910030  
Model/Type : GiAir Plus Calibration Date : 27-Apr-25  
Next calibration date : 07-Jul-25

### Reference Standard Low Flow Meter

Equipment name : Air Flow Meter Equipment ID : RYG\_FS0208  
Brand : MesaLabs Serial No. : 130027  
Model/Type : Defender 510-L Calibration Date : 27-Jan-25  
Due Date : 26-Jan-26

### Reference Standard High Flow Meter

Equipment name : Air Flow Meter Equipment ID : BKK\_FS0614  
Brand : MesaLabs Serial No. : 151114  
Model/Type : Defender 510-M Calibration Date : 9-Sep-24  
Due Date : 9-Sep-25

### Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.5	20.4	20.6	20.5	5%	19 - 21	Passed
50	50.2	50.4	50.3	50.3	5%	48 - 53	Passed
100	99.6	99.7	99.5	99.6	5%	95 - 105	Passed
200	202.6	202.8	202.9	202.8	5%	190 - 210	Passed
High Flow							
500	505.9	506.8	505.6	506.1	3%	485 - 515	Passed
1000	1016.6	1013.6	1012.8	1014.3	3%	970 - 1030	Passed
2000	2004.1	2005.5	2004.3	2004.6	3%	1940 - 2060	Passed
2500	2492.0	2494.7	2490.4	2492.4	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: [Signature]

( Mr.Natchapon Thamklang )

RYG Field Services Scientist (1)

Issue date : 07-Apr-25

Approved By: [Signature]

( Mr.Supot Salamteh )

RYG Field Services Section Head



## Certificate of Calibration

Certificate No. : C-070425-RYG\_FS0165

### Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump Equipment ID : RYG\_FS0165  
Brand : Gillan Serial No. : 20150910037  
Model/Type : GiAir Plus Calibration Date : 07-Apr-25  
Next calibration date : 07-Jul-25

### Reference Standard Low Flow Meter

Equipment name : Air Flow Meter Equipment ID : RYG\_FS0208  
Brand : MesaLabs Serial No. : 130027  
Model/Type : Defender 510-L Calibration Date : 27-Jan-25  
Due Date : 26-Jan-26

### Reference Standard High Flow Meter

Equipment name : Air Flow Meter Equipment ID : BKK\_FS0614  
Brand : MesaLabs Serial No. : 151114  
Model/Type : Defender 510-M Calibration Date : 9-Sep-24  
Due Date : 9-Sep-25

### Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.0	20.2	20.3	20.2	5%	19 - 21	Passed
50	49.5	50.6	50.1	50.1	5%	48 - 53	Passed
100	102.9	103.0	101.4	102.4	5%	95 - 105	Passed
200	201.6	203.1	202.1	202.3	5%	190 - 210	Passed
High Flow							
500	494.8	495.5	495.1	495.1	3%	485 - 515	Passed
1000	1004.4	1001.9	1005.2	1003.8	3%	970 - 1030	Passed
2000	2007.8	2002.0	2005.5	2005.1	3%	1940 - 2060	Passed
2500	2503.0	2501.3	2503.7	2502.7	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: [Signature]

( Mr.Natchapon Thamklang )

RYG Field Services Scientist (1)

Issue date : 07-Apr-25

Approved By: [Signature]

( Mr.Supot Salamteh )

RYG Field Services Section Head



## Air Sampling Pump Calibration Report

### Air Sampling Pump Detail

Calibration Date : 6 Jan 2025 Next cal. : 6 Apr 2025  
Air Sampling Pump ID : RYG\_FS0108 Barometric (mmHg) : 755.9  
Serial No. : 20150310157 Temperature ( °C ) : 25.9

### Reference Standard Low Flow Meter

Brand : MesaLabs ID : RYG\_FS0208  
Model : Defender 510-L Serial No. : 130027  
Due Date : 13-Aug-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		21	19	
20	19.8	20.7	20.2	20.2			Passed
50	50.6	50.7	50.7	50.7	52.5	47.5	Passed
100	98.7	99.7	100.2	99.5	105	95	Passed
200	197.5	197.0	197.6	197.4	210	190	Passed
500	512.7	489.7	500.4	500.9	515	485	Passed
1000	1002.9	1001.2	998.7	1000.9	1010	990	Passed
2000	2015.6	1996.1	1995.5	2002.4	2020	1980	Passed
2500	2503.2	2514.9	2517.6	2511.9	2550	2450	Passed

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

Calibrated by : [Signature]  
( Mr. Nantawat Sarin )  
Enviro Field Services Scientist (1)

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



## Air Sampling Pump Calibration Report

## Air Sampling Pump Detail

Calibration Date	: 6 Jan 2025	Next cal.	: 6 Apr 2025
Air Sampling Pump ID	: RYG_FS0114	Barometric (mmHg)	: 755.9
Serial No.	: 20150310163	Temperature ( °C )	: 25.9

## Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-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	20.7	21.0	20.9	20.9	21	19	Passed
50	49.8	49.7	50.9	50.1	52.5	47.5	Passed
100	99.9	100.1	100.0	100.0	105	95	Passed
200	200.1	203.2	200.6	201.3	210	190	Passed
500	505.9	493.9	509.4	503.1	515	485	Passed
1000	1005.4	1004.6	1004.8	1004.9	1010	990	Passed
2000	1995.8	1995.2	1999.5	1996.8	2020	1980	Passed
2500	2496.8	2490.8	2491.3	2493.0	2550	2450	Passed

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

Calibrated by :

( Mr. Nantawat Sarin )  
Enviro Field Services Scientist (1)

Approved By :

( Mr. Wichan Choonharat )  
Enviro Field Services Manager

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



## Air Sampling Pump Calibration Report

## Air Sampling Pump Detail

Calibration Date	: 7 Jan 2025	Next cal.	: 7 Apr 2025
Air Sampling Pump ID	: RYG_FS0136	Barometric (mmHg)	: 751
Serial No.	: 20150410012	Temperature ( °C )	: 25.0

## Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-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	20.8	20.6	20.9	20.8	21	19	Passed
50	49.7	50.3	50.1	50.0	52.5	47.5	Passed
100	100.5	100.9	101.5	101.0	105	95	Passed
200	200.6	200.3	200.4	200.4	210	190	Passed
500	509.2	512.6	508.2	510.0	515	485	Passed
1000	999.4	1007.1	1002.8	1003.1	1010	990	Passed
2000	2001.1	1992.2	2002.1	1998.5	2020	1980	Passed
2500	2525.5	2514.9	2501.7	2514.0	2550	2450	Passed

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

Calibrated by :

( Mr. Chanon Booncheun )  
Enviro Field Services Scientist (1)

Approved By :

( Mr. Wichan Choonharat )  
Enviro Field Services Manager

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

ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Phatthanakan, Suan Luang, Bangkok 10250  
T +66 2 760 3000 F +66 2 760 3197

## Certificate of Calibration

Certificate No. : C-060425-RYG\_FS0146

## Air Sampling Pump Detail

Equipment name	: Personal Air Sampling Pump	Equipment ID	: RYG_FS0146
Brand	: Gillan	Serial No.	: 20150310176
Model/Type	: GILAir Plus	Calibration Date	: 06-Apr-25
		Next calibration date	: 06-Jul-25

## Reference Standard Low Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: RYG_FS0208
Brand	: MesaLabs	Serial No.	: 130027
Model/Type	: Defender 510-L	Calibration Date	: 27-Jan-25
		Due Date	: 26-Jan-26

## Reference Standard High Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: BKK_FS0614
Brand	: MesaLabs	Serial No.	: 151114
Model/Type	: Defender 510-M	Calibration Date	: 9-Sep-24
		Due Date	: 9-Sep-25

## Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.6	20.3	20.4	20.4	5%	19 - 21	Passed
50	51.8	51.3	52.0	51.7	5%	48 - 53	Passed
100	101.8	101.6	101.7	101.7	5%	95 - 105	Passed
200	200.7	200.6	201.0	200.8	5%	190 - 210	Passed
High Flow							
500	511.3	513.5	507.9	510.9	3%	485 - 515	Passed
1000	996.8	1009.1	1000.5	1002.1	3%	970 - 1030	Passed
2000	1996.6	1995.5	2002.4	1998.2	3%	1940 - 2060	Passed
2500	2493.2	2495.7	2492.6	2493.8	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By :

  
( Mr. Watcharin Pongsamsuan )  
RYG Field Services Scientist (1)

Issue date : 06-Apr-25

Approved By :

  
( Mr. Supot Salameh )  
RYG Field Services Section HeadALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Phatthanakan, Suan Luang, Bangkok 10250  
T +66 2 760 3000 F +66 2 760 3197

## Certificate of Calibration

Certificate No. : C-070425-RYG\_FS0156

## Air Sampling Pump Detail

Equipment name	: Personal Air Sampling Pump	Equipment ID	: RYG_FS0156
Brand	: Gillan	Serial No.	: 20150910028
Model/Type	: GILAir Plus	Calibration Date	: 07-Apr-25
		Next calibration date	: 07-Jul-25

## Reference Standard Low Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: RYG_FS0208
Brand	: MesaLabs	Serial No.	: 130027
Model/Type	: Defender 510-L	Calibration Date	: 27-Jan-25
		Due Date	: 26-Jan-26

## Reference Standard High Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: BKK_FS0614
Brand	: MesaLabs	Serial No.	: 151114
Model/Type	: Defender 510-M	Calibration Date	: 9-Sep-24
		Due Date	: 9-Sep-25

## Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	19.6	19.8	19.7	5%	19 - 21	Passed
50	50.2	49.6	50.9	50.2	5%	48 - 53	Passed
100	100.9	100.7	100.1	100.6	5%	95 - 105	Passed
200	198.5	198.3	198.5	198.4	5%	190 - 210	Passed
High Flow							
500	509.8	507.2	510.3	509.1	3%	485 - 515	Passed
1000	1018.3	1012.0	1013.1	1014.5	3%	970 - 1030	Passed
2000	2013.9	2019.3	2010.4	2014.5	3%	1940 - 2060	Passed
2500	2518.5	2541.9	2516.6	2525.7	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By :

  
( Mr. Natchapon Thamklang )  
RYG Field Services Scientist (1)

Issue date : 07-Apr-25

Approved By :

  
( Mr. Supot Salameh )  
RYG Field Services Section Head





## Certificate of Calibration

Certificate No. : C-070425-RYG-FS0159

### Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump Equipment ID : RYG-FS0159  
Brand : Gillan Serial No. : 20150910031  
Model/Type : GAIR Plus Calibration Date : 07-Apr-25  
Next calibration date : 07-Jul-25

### Reference Standard Low Flow Meter

Equipment name : Air Flow Meter Equipment ID : RYG-FS0208  
Brand : MesaLabs Serial No. : 130027  
Model/Type : Defender 510-L Calibration Date : 27-Jan-25  
Due Date : 26-Jan-26

### Reference Standard High Flow Meter

Equipment name : Air Flow Meter Equipment ID : BKK-FS0614  
Brand : MesaLabs Serial No. : 151114  
Model/Type : Defender 510-M Calibration Date : 9-Sep-24  
Due Date : 9-Sep-25

### Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/Fail)
	1	2	3				
<b>Low Flow</b>							
20	19.4	19.5	19.4	19.4	5%	19 - 21	Passed
50	48.7	51.1	50.4	50.1	5%	48 - 53	Passed
100	104.1	104.1	104.0	104.1	5%	95 - 105	Passed
200	200.4	200.8	201.4	200.9	5%	190 - 210	Passed
<b>High Flow</b>							
500	498.3	498.6	498.5	498.5	3%	485 - 515	Passed
1000	1003.7	1002.1	1003.1	1003.0	3%	970 - 1030	Passed
2000	2009.7	2009.0	2009.2	2009.3	3%	1940 - 2060	Passed
2500	2501.6	2502.6	2495.5	2499.9	3%	2425 - 2575	Passed

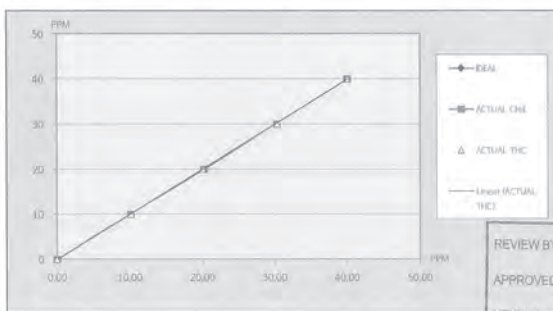
### END OF REPORT

Calibrated By: ณัฐชนน Approved By: Spt S  
( Mr.Natchapon Thamklang ) ( Mr.Supt Salameh )  
RYG Field Services Scientist (1) RYG Field Services Section Head  
Issue date : 07-Apr-25

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป (ประเทศไทย) จำกัด)						
EQUIPMENT NAME	: THC Analyzer						
MANUFACTURER	: HORIBA	MODEL	: APHA-370	SERIAL NO	: U430GTHB		
STANDARD GAS CONCENTRATION (PPM) (CH4)	: 506.1 PPM			CYLINDER NO	: CCT34373		
CYLINDER PRESSURE (psig)	: 1,600 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	0.00	0.00	0.00	-	0.00	0.00	-
1	10.00	10.15	0.15	1.50	10.21	0.21	2.10
2	20.00	20.30	0.30	1.50	20.10	0.10	0.50
3	30.00	30.29	0.29	0.97	30.33	0.33	1.10
4	40.00	40.00	0.00	0.00	40.00	0.00	0.00
AVERAGE (%)				0.99		0.93	



REVIEW BY: Tranita K.  
APPROVED BY: D. S.  
NEXT CAL DATE: 25/07/2025  
CALIBRATED BY: ทนาย  
CHECKED BY: ณัฐชนน  
DATE: 25/4/24

ผลการสอบเทียบตามเกณฑ์เป็นดังนี้ : เจ้าหน้าที่ปฏิบัติงานการสอบเทียบ : โทร 02-868-0812 # 15,16, E-Mail : Engineering@natec.com  
วันที่ 13/14-15/17/25-36 สอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 โทร 02-868-0812-13 โทรสาร 02-868-1889

### CHECK LIST

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป (ไทย) จำกัด)			
EQUIPMENT NAME	: THC Analyzer			
MANUFACTURER	: HORIBA	MODEL	: APHA-370	SERIAL NO. : U430GTHB
TEST VALUES				
NO.	THC Analyzer ( APHA - 370 )	UNIT	BEFORE	AFTER
1	Signal ( CH4 )	mV	35.60	35.80
2	Signal ( THC )	mV	38.80	39.20
3	Detector	Temp °C , Standard Value : Ambient Temp (5°C to 19°C) Pressure kPa , Standard Value : (Ambient/1013x100-20)±4kPa	46.00 69.30	46.90 69.30
4	Ambient	kPa, current atmospheric pressure	100.30	100.30
5	Purifier	°C , Standard Value : 390 °C to 430 °C kPa , Normal value : 8 kPa to 25 kPa	420.00 9.80	420.50 9.80
6	NMHC	°C , Standard Value : 230 °C to 260 °C	244.00	244.80
7	DC 24 V	V , Standard Value : 24 V ± 0.5 V	24.00	24.00
8	DC 5 V	V , Standard Value : 5 V ± 0.5 V	5.00	5.00
9	Bypass (Optional)	L/min, Normal value : 0.9 L/min ± 0.3 L/min	-	-
10	Over Flow (Optional)	L/min, Standard Value : 0.8 L/min or More	-	-
11	CH4 Sampling Reading	PPM	2.93	2.83
12	NMHC Sampling Reading	PPM	0.25	0.11
13	THC Sampling Reading	PPM	3.18	2.13
14	Zero Gas CH4/THC	PPM	0.13/0.18	0.00/0.00
15	Span Gas	PPM	56.19/56.43	60.00/60.00
16	Gas H2	20 PSI	20	20

Remark : (Reference : EX-EN-017-56, Ambient THC Monitor APHA-370 Operation Manual Page #81)  
Remark : (Ambient temperature > 5°C to 40°C)

ผลการตรวจสอบ : Air Filter สปริงเกอร์เปลี่ยนสภาพ, Filter/Sponge สปริงเกอร์เปลี่ยนสภาพ  
รายละเอียดการดำเนินการ : การ Service Maintenance เป็นชิ้น Air Filter , 0.3 , เปลี่ยน Filter/Sponge , ทำ Calibration Zero/Span , Multipoint  
ผลการดำเนินการ : ชิ้นของ เครื่องสอบเทียบมีการตรวจวัดได้ตามปกติ  
CALIBRATED BY: ณัฐชนน (DATE: 25/4/24)  
CHECKED BY: ณัฐชนน (DATE: 25/4/24)

ผลการสอบเทียบตามเกณฑ์เป็นดังนี้ : เจ้าหน้าที่ปฏิบัติงานการสอบเทียบ : โทร 02-868-0812 # 15,16, E-Mail : Engineering@natec.com  
วันที่ 13/14-15/17/25-36 สอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 ผลสอบเทียบตาม 7,7/1 โทร 02-868-0812-13 โทรสาร 02-868-1889



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICE  
3340 PATTANAKARN ROAD SOI 10, BANGKOK U.S.A. BANGKOK 10260 THAILAND  
TEL: 02-2775-8888 FAX: 02-2779-8888



Cert.No.: 24CH96  
Page: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : SevenCompact S220  
Serial No. : C104059460  
ID No. : RYG\_EN0183  
Condition As-Received : Used Item  
Received Date : 18 January 2024  
Calibration Date : 18 January 2024  
Reference : 2401-0579DSC-2  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5, T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand

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

Calibrated by : Warakorn Lernagatrakul

Approved by : Saitip  
Approved Signatory

(✓) Saitip Meangmai  
( ) Warakorn Lernagatrakul  
( ) Porpan Palpin

Issue Date : 24 January 2024

The Uncertainties are for a confidence probability of approximately 95%

Thailand (Thailand) Co., Ltd. (Rayong Branch) (Rayong Branch) (Rayong Branch) (Rayong Branch)  
Approved by (Thailand) Co., Ltd. (Rayong Branch) (Rayong Branch) (Rayong Branch) (Rayong Branch)



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

#### Condition of this calibration result

##### 1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-  
- Technology Promotion Association (Thailand-Japan)

##### 2. Certified Reference Materials

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

#### Calibration Results

##### Function : mV Measurement

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

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement ( $\pm$ mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S/N: C104059460	4.000	177.48	177.4	4.000	0.058	2.00	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00		
	10.000	-177.46	-177.5	10.000	0.058	2.00		

Signature

1198287



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

#### Calibration Results

##### Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement ( $\pm$ )	Coverage factor k
pH Electrode S/N: 3225367	4.008	4.013	176.0	0.0054	2.07
	6.986	6.983	2.2	0.0064	2.00
	9.997	9.996	-174.1	0.0065	2.00

##### Function : Temperature Measurement

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

This equipment was connected with Temperature Probe:

- Model : InLab®Expert Pro-ISM  
- Serial No. : 3225367

Dimension of probe:

- Length : 120 mm.  
- Diameter : 12 mm.  
- Immersion Depth : 100 mm.

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

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

-000-

Signature

1198288



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLADANG, BANGKOK, 10250  
TEL: 0-2717-3000-31 FAX: 0-2719-9484



## Certificate of Calibration

Certificate No.: 24E289  
Page: 1 of 2

Equipment:	pH Meter	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.
Manufacturer:	Mettler Toledo	
Model:	SevenCompact 5220	
Serial No.:	C104059460	
ID No.:	RYG_EMR183	
Condition As-Received:	Used Item	
Received Date:	18 January 2024	
Calibration Date:	23 January 2024	
Reference:	2401-05790SC	Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
Ambient Temperature:	( 23 $\pm$ 2 ) °C	878/10 Moo 5, T.Maeveit Kho, A.Phuakdaeng, Rayong 21140, Thailand
Relative Humidity:	( 50 $\pm$ 10 ) %	

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 According to EURAMET cg-16.

#### Condition of this result of calibration

##### 1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibration	5500A	6315011	E2U2300035	29 May 2024

##### 2. This result of calibration was made on request at the point specified by customer

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

##### 4. This Certification is traceable to the International System of Unit maintained through:-

-NA Caltechologies Co., Ltd., ANAB Accredited No. Calibration AC-2658

Calibrated by: Winchareporn Wongchitkarn  
Issue Date: 24 January 2024

Approved Signatory:  
( ) Phatthana Prabporat  
( ) Nuntawat Khanchai  
( ) Pongsagorn Boonyesorn

11983296



Cert. No.: 24E289  
Page: 2 of 2

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

Function: DC voltage measurement

Range: 2000 mV

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

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

UUC\* = Unit Under Calibration.

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1198963





## Certificate of Calibration

Cert. No.: 25LM10  
Page.: 1 of 2

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000-115V

Serial No. : 15E102796

ID No. : RYG\_EN0032

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

Received Order : 17 January 2025  
Calibrated Date : 20 January 2025  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Warakorn Lerngagtrakul

Approved by :

( ) Chakrit Waewwanjua  
(✓) Suwit Imjai  
( ) Kunchit Promprat

Issue Date : 23 January 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 Corporate Services 3: Equipment Calibration and Testing Services.

REVIEW BY *Photchana S.*  
APPROVED BY *D. Kham*  
NEXT CAL DATE 20/07/26



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2501-0600DSC-2

Cert. No.: 25LM10  
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	241022	TPA	17 Sep 2025
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.: 15E100464

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
20.00	60	20.002	19.81	-0.192	0.15	2.00

UUC\* : Unit Under Calibration

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

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## Certificate of Testing

Cert.No.: 25TW15  
Page.: 1 of 2

Equipment : DO Meter

Manufacturer : YSI

Model : 5000-115V

Serial No. : 15E102796

ID No. : RYG\_EN0032

Received Date : 17 January 2025

Test Date : 20 January 2025

Reference : 2501-0600DSC-1

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

Laboratory Condition : Temperature ( 25 ± 5 ) °C  
Humidity ( 50 ± 20 ) %

Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :

( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Saithip Meangmai

Issue Date : 21 January 2025

*Saithip*  
Approved Signatory



Cert.No.: 25TW15  
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	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

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

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0084

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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## Certificate of Calibration

Cert. No.: 24TM1663  
Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG\_EN0154

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

Location : BOD Room

Received Order : 01 November 2024

Calibration Date : 01 November 2024

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Krisda Malee

Approved by :

( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

Issue Date : 07 November 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.

REVIEW BY *Thanitak*

APPROVED BY *D. Amara*

NEXT CAL DATE: 01/05/26



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2411-0002OC-1  
Procedure Used :-

Cert. No.: 24TM1663  
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1.) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

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.

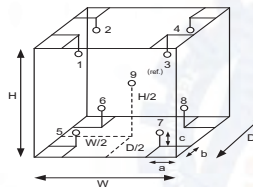
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration : ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	25
REL.Humid. ( % )	55	53
AC Supply ( Volt )	220	221



### Probe Installation Details :

a = 10 cm  
b = 10 cm  
c = 10 cm

### Dimension of Chamber :

D = 0.60 m  
W = 1.0 m  
H = 1.2 m  
Capacity = 0.72 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2411-0002OC-1  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 24TM1663  
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.762	20.056	20.026	20.033	0.30

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

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

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

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included 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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## Certificate of Calibration

Cert.No.: 24CG3711  
Page: 1 of 2

Equipment : Burette

Capacity : 50 mL

Serial No. : -

ID. No. : RYG\_EN0216

Manufacturer : Witeg

Made in : Germany

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

Ambient Temperature : (20 ± 2.5) °C  
Relative Humidity : (50 ± 10) %  
Barometric Pressure : 756 mmHg  
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Sa-ngueunkam Wongsra

Approved by :

(✓) Srisuda Khamtha  
( ) Ponpan Paipim  
( ) Unnopphol Harachai

Issue Date : 24 September 2024

REVIEW BY *Thanitak*

APPROVED BY *D. Amara*

NEXT CAL DATE: 24/09/25

The Uncertainties are for a confidence probability of approximately 95%

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





Equipment : Burette  
Received Date : 19 September 2024  
Condition As-Received : Used Item  
Calibration Date : 24 September 2024  
Reference : 2409-0756DSC-3

Cert.No.: 24CG3711  
Page.: 2 of 2

#### Condition of this result of calibration

##### 1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134206712	140RC007	24MM316	TPA	15 July 2025
2) Data Logger	HL-20D	20683159	140EC012	23H2174	TPA	10 Oct 2024
3) Thermometer	-	1594592	140EC010	241175	TPA	20 Feb 2025

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.  
3. True value is converted to true volume at the standard temperature of 20 °C

#### Calibration result :

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( ± mL )	k Factor
10	10.0259	0.0082	2.00
20	20.0214	0.0085	2.00
30	30.0006	0.0089	2.00
40	40.0003	0.0094	2.00
50	49.9988	0.011	2.00

Remark mL = cm<sup>3</sup>

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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## Certificate of Calibration

Equipment: SPECTROPHOTOMETER  
Model: DR6000  
Serial No. (or ID.): 1627845 (RYG\_EN0037)  
Manufacturer: HACH  
Condition: In Condition

Certificate No.: C06250108  
Issued Date: 18 March 2025  
Job No.: WO-00064379  
Page: 1 of 3

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

APPROVED BY   
NEXT CAL DATE 18/09/26

Environment Condition: Temperature 24.4 °C ± 0.3 °C  
Humidity 60.8 %RH ± 3.5 %RH

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

Calibration By: Mr.Preecha Phooarsai  
Calibration Date: 18 March 2025  
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 111583 and 111584  
The standard for Photometric Certificate No. 9114984 and 111588  
The standard for Stray light Certificate No. 111586 and 111585  
The standard for Spectral resolution Certificate No. 111587

(Mr. Preecha Phooarsai)  
Person in charge

(Miss Kaewkan Suradech)  
Authorized signatory

This certificate is issued in 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 Measurements (GUM).

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

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Phraechin, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-16: 11 Mar 2024



Certificate No.: C06250108 Page 2 of 3

#### Calibration Results:

##### Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.5	0.11	0.13
536.66	536.7	-0.04	0.13
637.98	638.3	-0.32	0.13
748.48	748.6	-0.32	0.13
807.03	807.5	-0.47	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.291	0.0020	0.0045
	0.5168	0.518	-0.0012	0.0045
	1.0298	1.031	-0.0012	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2857	0.285	0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0083	1.009	-0.0007	0.0045
485 nm	0.0000	0.000	0.0000	0.0045
	0.2518	0.250	0.0016	0.0045
	0.4595	0.461	-0.0015	0.0045
	0.9334	0.935	-0.0016	0.0045
545.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.246	0.0001	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.948	-0.0012	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.259	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.258	-0.0001	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.973	-0.0010	0.0045

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CAL-FM-C06-16: 11 Mar 2024



Certificate No.: C06250108 Page 3 of 3

#### Calibration Results:

##### Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7355	0.738	-0.0025	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080
Stray light *				
Standard: cut-off		UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
280.62 ± 0.11 nm		280.6	1.7	1.770
391.44 ± 0.11 nm		391.4	1.4	1.854
Spectral Resolution *				
Nominal Concentration 0.02 % w/v		Peak	Trough	Ratio
Standard Wavelength ( nm )		268.66	266.69	1.38
UUC: Wavelength (nm)		268.2	266.2	2.00
Std Absorbance ( A )		0.4566	0.2780	
UUC: Absorbance ( A )		0.413	0.299	

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

The End of Certificate

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CAL-FM-C06-16: 11 Mar 2024



## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ถึง)		หมายเหตุ
18 Mar 2025			18 Mar 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ซอว์ใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC.	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แสงยูวีแคบแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	13.5 Hours	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แสงที่ผ่านแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	893.0 Hours	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ซอว์รถหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>		
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันฝุ่น Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ไม่มีตัวอย่าง (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นับ 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สารละลาย Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เซ็นเซอร์อุณหภูมิ: \* 656.1nm = 656.1nm

\* 486.0nm = 485.7nm

Mr.Preecha Phooarsai  
Service Engineer

บริษัท เทคโนโลยี จำกัด  
DKSH Technology Limited  
2532 แขวงวิเศษไชยชาญ ถนนวิเศษไชยชาญ ตำบลวิเศษไชยชาญ อำเภอวิเศษไชยชาญ จังหวัดวิเศษไชยชาญ 10100  
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CAL-FM-R31-03: 20 Jul 2022

SARTORIUS



Accredited by

NSC-TISI-TIS 17025

Calibration 0426

## Calibration certificate

Calibration Certificate No. 258KL0004

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSE224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial   QM Ident. no.	26207038   RYG_EN0002	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Plua Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	06 Mar 2025	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Kachen Lalee

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129 Rama 9 Road, Huaykwang  
10310 Bangkok

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Calibration certificate No.: 258KL0004

Calibration Certificate

## Calibration object

### Single range instrument

Model	MSE224S-100-DU
Serial Number	26207038
QM Ident. no   Inventory no.	RYG_EN0002   ---
Maximum capacity (Max. load)	220.0000 g
Measured range	220.0000 g
Scale interval	0.0001 g

## Place of calibration

Address	According to page 1
Department   Cost center	Laboratory Department.   ---
Building   Floor	---   1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

## Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

## Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Calibration certificate No.: 258KL0004

Calibration Certificate

## Adjustment Status

The measuring device was internally adjusted before the calibration.

## Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration   Temp. diff.	24.4 °C   0.6 K
Weights - Tplace	
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 50.2 %RH.

## Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 10 g   200 g	Test load (nominal): 100 g
10 g	200 g
1	10.0000 g
2	10.0000 g
3	10.0001 g
4	10.0000 g
5	10.0001 g
6	10.0001 g
7	10.0000 g
8	10.0000 g
9	10.0001 g
10	10.0000 g
s = 0.00005 g	s = 0.00005 g

### Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
L	I	E	k	U(E)	Urel(E)
0.0100 g	0.0100 g	0.0000 g	2.00	0.00013 g	1.3 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.027 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00014 g	0.0027 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00014 g	0.0014 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00072 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00016 g	0.00032 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00021 g	0.00021 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00034 g	0.00017 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00039 g	0.00018 %
Maximum error of indication		E max = 0.0001 g			

Urel(E) is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under Appendix to the calibration certificate | Interpretation of measurement results.  
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

### End of calibration certificate

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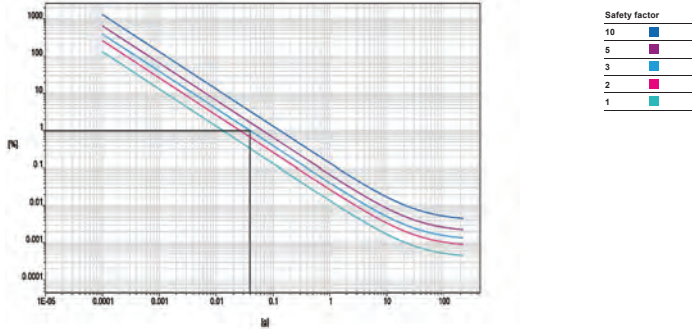
## Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	1 · 10 <sup>-4</sup> /K
Uncertainty of the weighing result $U_{95}(W)$	$U_{95}(W) = 0.00013 \text{ g} + 3.95 \cdot 10^{-4} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading  $R$  into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication $R$	Uncertainty $U_{95}(W)$	Uncertainty relative $U_{95}(W)_{rel}$
1 %	2.2000 g	0.00014 g	0.0063 %
25 %	55.0000 g	0.00035 g	0.00063 %
50 %	110.0000 g	0.00056 g	0.00051 %
75 %	165.0000 g	0.00078 g	0.00047 %
100 %	220.0000 g	0.00100 g	0.00045 %

### Graphic realization of the relative uncertainty of measurement | process accuracy



### Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0395 g

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert. No.: 24TM632  
Page : 1 of 3

Equipment :	Hot Air Oven	REVIEW BY <i>Thanitak</i>
Manufacturer :	Memmert	APPROVED BY <i>D. J. J.</i>
Model :	UFE 500	NEXT CAL DATE: 21/09/25
Serial No. :	G511.1572	
ID No. :	RYG_EN0010	
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand	
Location :	Oven Room	
Received Order :	21 March 2024	
Calibration Date :	21 March 2024	
Ambient Temperature :	(26 ± 10) °C	
Relative Humidity :	(50 ± 30) %	
Calibrated by :	Man Pattanapongpaiboon	
Approved by :	<i>[Signature]</i> Approved Signatory	
( ) Pornthippa Tameyakul ( ) Unnoppol Harachai (✓) Suwit Imjai		
Issue Date :	22 March 2024	

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2403-0563OC-1

Cert. No.: 24TM632  
Page : 2 of 3

### Procedure Used :-

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 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)

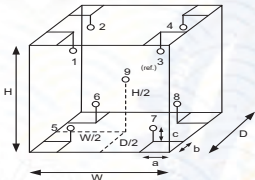
Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	57	59
AC Supply (Volt)	222	224

Ref. Std. ID No.: @ Calibration Point		
Position :	(180) °C	(104) °C
1	18-18TC-01	18-18RTD-01
2	18-18TC-02	18-18RTD-02
3	18-18TC-03	18-18RTD-03
4	18-18TC-04	18-18RTD-04
5	18-18TC-05	18-18RTD-05
6	18-18TC-06	23-18RTD-06
7	18-18TC-07	18-18RTD-07
8	18-18TC-08	22-18RTD-08
9 (ref.)	18-18TC-09	18-18RTD-09



Probe Installation Details :		Dimension of Chamber :	
a =	5.0 cm	D =	0.40 m
b =	5.0 cm	W =	0.56 m
c =	5.0 cm	H =	0.48 m
Capacity =			0.11 m³



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2403-0563OC-1  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 24TM632  
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.051	0.59	0.62	2
180.0	180.0	180.0	0.15	1.3	1.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	103.921	103.786	103.757	103.759	103.950	103.817	104.213	103.672	103.673	0.42
180.0	179.614	179.270	179.145	179.599	180.001	180.423	180.293	180.629	179.429	1.1

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

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

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

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC\* : Unit Under Calibration

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

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

-000-



## Metrology

SCI ECO Services Company Limited

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

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



Certificate No. T250454

Page 1 of 3

### Certificate of Calibration

Equipment : Chamber ( Oven )  
Manufacturer : MEMMERT  
Model : UF 110  
Serial No. : B423.0853  
Customer Code : RYG\_EN0213  
ID No. : T5884A5  
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)



616/10 Moo 5 T.Maenam Khu,

A.Pluakdaeng, Rayong 21140

Customer Location : ENVIRONMENT LABORATORY

Date of Receipt : 12 March 2025

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By : *Boonchai* Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 21 MAR 2025

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

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

FM-L14 I18/18-08-66



## Metrology

SCI ECO Services Company Limited

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



Certificate No. T250454

Page 2 of 3

### Calibration Report

Equipment : Chamber ( Oven )  
Date of Calibration : 19 March 2025  
Environment : Temperature : 26.5-26.9 °C  
Line Voltage : 223.9-231.3 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2019 ) and AS2853-1986 ).  
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

#### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	27-(CH1-10)	T240709	19 April 2025
DATA LOGGER	34970A	T149	T240709	19 April 2025

#### 3. This certificate is traceable to :

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

#### 4. Condition of calibrated item : good

##### Equipment Description :

Time Constant : 1 Hour 44 Minute At 104 °C  
Fresh Air Damper : ☐ Open ☒ Min ☐ Medium ☐ Max  
☒ Close  
☐ Not Available

#### 5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By : *Boonchai*

FM-L15 I18/18-08-66



## Metrology

SCI ECO Services Company Limited

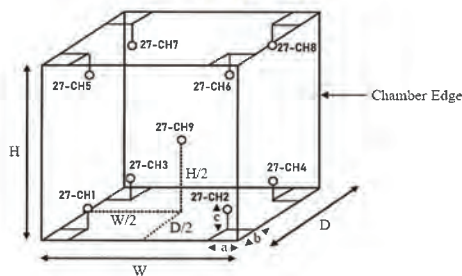
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T250454

Page 3 of 3

### Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm , H (Height) = 48 cm and D (Depth) = 40 cm.  
Size of installed Standard sensor number 27-CH1 to number 27-CH8 : a = 5 cm , b = 5 cm and c = 5 cm  
Size of installed Standard sensor number 27-CH9 : W/2 = 56 cm/2 , H/2 = 48 cm/2 and D/2 = 40 cm/2

#### Measurement Results

Average Standard Reading at each position (°C)								
Calibration Point	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8
104	103.84	104.10	104.10	104.48	103.73	104.14	103.95	103.57
180	179.41	179.92	180.80	181.37	179.54	179.52	179.82	180.31

Chamber ( Oven )			Temperature Distribution				
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
104.0	103.9 , 104.1	104.0	104.01	0.08	0.65	0.42	2.00
180.0	-	180.0	180.01	0.17	1.26	0.49	2.00

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

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

End of Certificate.

Approved By : *Boonchai*

FM-L15 I18/18-08-66



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL.0-2717-3000-29 FAX.0-2719-9484



### Certificate of Calibration

Cert. No.: 24TM635  
Page : 1 of 3

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNB22  
Serial No. : L513.0648  
ID No. : RYG\_EN0061

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

Location : Wet Chemistry Lab

Received Order : 21 March 2024  
Calibration Date : 21 March 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Man Pattanapongpaiboon

Approved by : *Man*  
Approved Signatory

( ) Pomthippa Tameyakul  
( ) Unnopphol Harachai  
(✓) Suwit Imjai

Issue Date : 23 March 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2403-0563OC-4  
Procedure Used :-

Cert. No.: 24TM635  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 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.

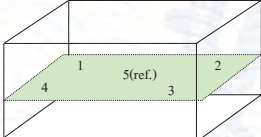
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Heat transfer medium used :** Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	25	55	222
Finished of Calibration	25	57	223



Front

Position :	Ref. Std. ID No.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2403-0563OC-4  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM635  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	84.428	84.424	84.489	84.507	84.477	0.18

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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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



## Certificate of Calibration


Cert.No.: 24CH771  
Page.: 1 of 2

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : Seven2Go S2  
Serial No. : B712869291  
ID No. : RYG\_FS0296

Condition As-Received: Used Item  
Received Date : 28 June 2024  
Calibration Date : 01 July 2024  
Reference : 2406-0969DSC-1  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch  
616/10 Moo 5, T.Maenam Khu,  
A.Pluaekdaeng, Rayong 21140, Thailand

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

Calibrated by : Warakorn Lerngatrakul

Approved by :   
Approved Signatory

( ) Unnopphol Harachai  
( ) Ponpan Paipim  
(✓) Sathip Meangmai

Issue Date : 03 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH771  
Page.: 2 of 2

**Condition of this calibration result**

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2026
pH 6.986	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

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

**Calibration Results**

**Function :** mV Measurement

**Performing standard curve by Document Process Calibrator at pH (4,7,10)**

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement ( ± mV )	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	177	4.00	0.58	2.00
S/N.: B712869291	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

**Function :** pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement ( ± )	Coverage factor k
pH Electrode	4.008	4.01	166	0.0079	2.00
S/N.: 2295995	6.986	6.99	-8	0.011	2.00
	9.997	10.00	-182	0.0095	2.00

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

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## Certificate of Calibration

Cert. No.: 24LM106  
Page.: 1 of 2

Equipment : pH Meter with Sensor  
Manufacturer : Mettler Toledo  
Model : Seven2Go S2  
Serial No. : B712869291  
ID No. : RYG\_FS0296  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
(Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,  
Rayong 21140 Thailand  
Location : TPA On Site Calibration Laboratory  
Received Order : 28 June 2024  
Calibrated Date : 01 July 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V  
Calibrated by : Warakorn Lemgagtrakul  
Approved by :   
( ) Ponpan Paipim  
(✓) Suwit Imjai  
( ) Kunchit Promprat  
Issue Date : 03 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : pH Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2406-0969DSC-2

Cert. No.: 24LM106  
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	2311216	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.: 2295995

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
25.0	100	25.004	25.2	0.196	0.16	2.00
30.0	100	30.002	30.3	0.298	0.16	2.00
40.0	100	40.003	40.3	0.297	0.16	2.00
50.0	100	50.004	50.3	0.296	0.16	2.00

UUC\* : Unit Under Calibration

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

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# ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน







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

40 Manganese...

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

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

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

18 Bis(2-ethylhexyl)phthalate...

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

36 Chrysene...



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

56 1,3-Dichloropropene...

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

76 γ-HCH...

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

94 N-Nitrosodiphenylamine...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup> 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4,25)</sup>

110 TPH (C<sub>8</sub>-C<sub>16</sub>)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C <sub>10</sub> -C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>9,22</sup>
111	TPH (C <sub>16</sub> -C <sub>35</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>9,22</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>62</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>61</sup>
126	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>62</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>

อากาศเสีย...

## อากาศเสีย (ปล่องระบาย) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
2	Arsenic	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
3	Beryllium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
4	Cadmium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup> 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup>
5	Carbon Monoxide	1) Instrumental Analyzer Method <sup>62</sup> 2) Sampling Bag Non-Dispersive Infrared Method <sup>61</sup>
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
10	Cresol	Absorption Sampling, Gas Chromatographic Method <sup>61</sup>
11	Dioxins	Isokinetic Sampling <sup>61</sup>
12	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
13	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method <sup>61</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>61</sup>
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>61</sup>

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>61</sup>
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
19	Opacity	Ringelmann's Method <sup>61</sup>
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>61</sup> 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method <sup>61</sup> 3) Instrumental Analyzer Method <sup>61</sup>
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>61</sup> 2) Instrumental Analyzer Method <sup>61</sup>
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>61</sup>
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method <sup>61</sup> 2) Paired Train, Isokinetic Sampling, Gravimetric Method <sup>61</sup>

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>61</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>61</sup>
28	Xylene	Absorption Sampling, Gas Chromatographic Method <sup>61</sup>

## สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>1,9,26</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>16,26</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>1,16</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>1,6,16</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>1,6,17</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>7,16</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>7,17</sup>

5 Beryllium...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.14.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.17.19)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.8.16.19)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.8.17.19)</sup>

10 Chromium (VI)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(4.6.19)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8.19)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
14	DDO	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup>

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>

22 Mercury...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1.6.20)</sup> 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1.6.30)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(21)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.28)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.28)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.17)</sup>
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(3.9.26)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(9.26)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11.26)</sup>

- 2-Chlorobiphenyl...

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

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,24)</sup> 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,17)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>

ดิน...

## ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13)</sup>
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
15	Benzog(h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,16)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,17)</sup>
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(15,25)</sup>
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(13,25)</sup>
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(11,29)</sup>

23 Cadmium...



ลำดับที่	สารเคมี	วิธีวิเคราะห์
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,14,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,17,19)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,19)</sup>

36 Chrysene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(27,28,29)</sup>
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
39	DDD	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
42	Dibenz(a,h)anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>

49 1,2-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>

63 Di-n-Octyl Phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(9,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,26)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup>
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13)</sup>

73 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	$\alpha$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
75	$\beta$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
76	$\gamma$ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(20)</sup> 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry <sup>(21)</sup> 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup>

84 Methanol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>

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 - 2,2',3,4,6'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
97	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>

99 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,26)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,24)</sup>
108	TPH (C <sub>5</sub> -C <sub>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,23)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(12,23)</sup>
110	TPH (C <sub>18</sub> -C <sub>35</sub> )	1) Automate Extraction, Gas Chromatographic Method <sup>(12,22)</sup> 2) Solvent Extraction, Gas Chromatographic Method <sup>(12,23)</sup> 3) Ultrasonic Extraction, Gas Chromatographic Method <sup>(12,23)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,25)</sup>

115 2,4,5-Trichlorophenol...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
115	2,4,5-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,29)</sup>
116	2,4,6-Trichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(10,28)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(11,29)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(15,23)</sup>
125	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,17)</sup>

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ที่ ๒๒๓๖๔/๔๓๒๒

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวง/กรุงเทพฯ  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ มีนาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรเพื่อปฏิบัติงานวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอมเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอเพิ่มเงิน/ค่าจ้าง/เปลี่ยนแปลงบุคลากร และขจัดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๔ มีนาคม ๒๕๖๗

ตามที่นายอภัยสิทธิ์ นริชิต เอมเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอปฏิบัติงานวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔-๖๑๐๔๔ ของสำนักงาน ๕๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ตามแนบรายชื่อแนบมา ดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๓. ให้ยกเลิกจำนวนที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวพรเมธิดา ทุมระ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒) นายกำชัย สุขะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๓) นางสาวสุทธิดา ปิ่นมูทะ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒. ให้เพิ่มจำนวนที่ประจำห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๒ ราย

๑) นางสาวฐานิดา เกื้อนเจริญ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๒) นางสาวณิษฐภัทร ลาภคำ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๓) นางสาวณิษฐภัทร ภิรมย์คำ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๔) นายอำนาจ วัฒนาคน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๕) นายสุทธินันท์ นิลสุวรรณ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๖) นายเสกสรรค์ พรหมยา ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๗) นายวิจิตรพงศ์ น้อยงามสวน ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๘) นายณัฐพงศ์ โสภา ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๙) นายศุภวัฒน์ ปานเพ็ญ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๑๐) นายณัฐพล ชุ่มชื่น ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๑๑) นายอนุชา สุขพันธ์ุ ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

๑๒) นายบรรณกร แก้วพงษ์ชัย ทะเบียนเลขที่ ๖-๒๐๔-๖-๐๑๒๕

อนึ่ง หนังสือแนบนี้...

อนึ่ง หนังสือฉบับนี้จะส่งมอบให้คุณแทนหนังสือต่ออายุขึ้นทะเบียนเพื่อปฏิบัติภารกิจวิเคราะห  
ในวันที่ ๒ กันยายน ๒๕๖๐

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพรศักดิ์ กสิณกรธ)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมส่งเสริมอุตสาหกรรม

กองวิจัยและพัฒนานวัตกรรม  
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และทะเบียนผู้ประกอบการ  
โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕  
โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๔  
ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทัน ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๘ ธันวาคม ๒๕๖๓

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒ ธันวาคม ๒๕๖๓

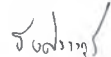
ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์  
จำนวน ๘ ราย ได้แก่

๑) นายประจักษ์ วรณชัย	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๐
๒) นายจิรวัฒน์ ขาวละออ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๑
๓) นายทวีวัฒน์ กำคำ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๒
๔) นางสาวอรุณ คำคำล่อง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๓
๕) นายกิตติพงศ์ แซ่ลี้	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๔
๖) นายจิรเมธ ประเสริฐศิริพงษ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๕
๗) นายภัทรพงษ์ มณฑาทอง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๖
๘) นางสาวจางวรรณ กระจำพันธุ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๗

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรศักดิ์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนานวัตกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และทะเบียนผู้ประกอบการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๔

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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทัน ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๐ เมษายน ๒๕๖๔

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒ เมษายน ๒๕๖๔


ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์  
จำนวน ๒ ราย ได้แก่

๑) นายอิทธิพงศ์ บัวแดง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๒
๒) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๓

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรศักดิ์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนานวัตกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และทะเบียนผู้ประกอบการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทัน ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒๓๖ ๘ ๑

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๕ มิถุนายน ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๙ พฤษภาคม ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร ความละเอียดดังนี้

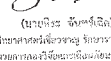
กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน  
จำนวน ๑๑ ราย ได้แก่

๑) นายอุดมกร มั่นชื่น	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๔
๒) นายอัมมกร แสนมาตร	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๕
๓) นายเอกรินทร์ บุคสิทธิ์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๖
๔) นายพิชญานนท์ อินธิกร	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๗
๕) นายศตวรรษ แก้วกันหา	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๘
๖) นายวิกรม มีศิริ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๐๙
๗) นายคณินท์ คำจันทร์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๐
๘) นายศิริวิทย์ มีไพฑูรย์	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๑
๙) นายพิรพงษ์ ศรีคำแหง	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๒
๑๐) นายอภิสิทธิ์ ศรีคงแก้ว	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๓
๑๑) ว่าที่ร้อยตรี ภาณุพงศ์ แสนศิริ	ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๑๑๔

อนึ่ง หนังสือฉบับนี้จะส่งมอบให้คุณแทนหนังสือต่ออายุขึ้นทะเบียนเพื่อปฏิบัติภารกิจวิเคราะห์เอกชน  
ในวันที่ ๒ กันยายน ๒๕๖๔

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายธีรศักดิ์ อิศรางกูร ณ อยุธยา)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนานวัตกรรม

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และทะเบียนผู้ประกอบการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทัน ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"







๐๘ สิงหาคม ๒๕๖๗

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอนแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๗ พฤษภาคม ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอนแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๓ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอนแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๒๓ สถานที่ตั้งเลขที่ ๖๓๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอลำปาง จังหวัดลำปาง

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอนแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน

- ๑) นายเดช ช้างชน
- ๒) นางสาวณิษฐ์ บริรักษ์
- ๓) นายสุพจน์ สยามเดช

ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๑  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๒  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๓

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

- ๑) นายณัฐพงษ์ เพ็ชรนา
- ๒) นางสาวกัญญารัตน์ รักดี
- ๓) นางสาวจุฑารัตน์ สีทองกลาง
- ๔) นางสาวจิตสุภา ประเทืองสุข
- ๕) นายสรสรณีย์ ค่อยกลอย
- ๖) นายณัฐวุฒิ อดมพรราช
- ๗) นายจิตรกร สีเสนา
- ๘) นายสิทธิพรชัย สุวรรณรัตน์
- ๙) นายสิทธิพันธ์ เสนาธิ์
- ๑๐) นายอนุวัฒน์ เตม
- ๑๑) นายสุวิทย์ นาทพงษ์
- ๑๒) นายณัฐพล เขียววิวัฒน์
- ๑๓) นายชานนท์ บุญชื่น
- ๑๔) นายณัฐกานต์ วงศ์อินทร์
- ๑๕) นายอานันท์ โพธิ์พรหมทอง

ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๑  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๒  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๓  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๔  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๖  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๗  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๘  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๐๙  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๐  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๑  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๔  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๖

๑๖) นายณิชาพล...

- ๑๖) นายณิชาพล ถักกลาง
- ๑๗) นายศุภณัฐ พิสัยพันธ์
- ๑๘) นายสันต์ คินันต์
- ๑๙) นายวิญญู วัฒนศิริ
- ๒๐) นายศุภณัฐ สกฤตติมงคล
- ๒๑) นายเอกชัย ถิ่นทอง
- ๒๒) นายพงษ์เทพ สิทธิเสนา
- ๒๓) นายพินกร ภุมมา
- ๒๔) นางสาวนันทยา บุญจันทร์
- ๒๕) นายสิทธิชัย อันพิมาย
- ๒๖) นางสาวภาวณีน พลทอง
- ๒๗) นางสาวพจนา สีดา
- ๒๘) นางสาวอนิศา กลุศิริวงศ์
- ๒๙) นายพิทยา ทองแดง
- ๓๐) นางสาวธิดา สุขเกษ
- ๓๑) วาที่ร้อยตรี ธนชัย ม่วงมา
- ๓๒) นายวรวิทย์ พันพา
- ๓๓) นายศักดิ์รินทร์ จรัสกาย
- ๓๔) นายสุรศักดิ์ สาขิน
- ๓๕) นายสฤตภาส งามแก้ว
- ๓๖) นายสุทธิดำรง โชคดีนันท์
- ๓๗) นายวิมลกร หันไชยเนาว์
- ๓๘) นางสาววนิดา เจริญตระกูล
- ๓๙) นายธนสิทธิ์ วงศ์ไชย
- ๔๐) นายชัยสุนทร เลิศนันท์กุลชัย
- ๔๑) นายสุจิตา เพ็ชรแสง
- ๔๒) นายกิตติภณ มณีสัมพันธ์
- ๔๓) นายอริณทร อธิจินดา
- ๔๔) นายศุภชัย วงศ์สุริยา
- ๔๕) นายโสภณ ดันท์
- ๔๖) นางสาวกิตติยา สัตยาธิปไตย
- ๔๗) นางสาวอริณทร ดันท์
- ๔๘) นายพิพัฒน์ นิกิตร์เศรษฐ์
- ๔๙) นายศิริวัชร เรืองสม
- ๕๐) นายปารเมศ สัตยาคุณ
- ๕๑) นายณพนาถ ธรรมเสโร
- ๕๒) นางสาวศุภกานต์ โสจันทร์

- ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๗  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๘  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๑๙  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๐  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๖  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๗  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๘  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๒๙  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๑  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๒  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๓  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๔  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๓๖  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๔๑  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๔๓  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๔๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๔๖  
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ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๔๙  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๐  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๑  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๒  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๓

๕๓) นายพชรกร...

- ๕๒) นายพชรกร เจริญ
- ๕๓) นายทิวากร เจริญ
- ๕๔) นายอนุวัชร ทองขจรศักดิ์
- ๕๕) นายอภิชาติ วิลาศ
- ๕๖) นายจิรวิทย์ ศรีวิภา
- ๕๗) นายประสาธมิตร เจริญพร
- ๕๘) นายภาณุวัฒน์ วังนง
- ๖๐) นายสันติ ชัยชนะ
- ๖๑) นายทินกร กุลชาติ

ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๔  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๕  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๖  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๗  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๘  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๕๙  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๖๐  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๖๑  
ทะเบียนเลขที่ ๖-๒๒๓-๙-๐๐๖๒

ค. ขอบข่ายชนิดสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย

ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒๘ มิถุนายน ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพารมภ์ กลิ่นกรอง)  
รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและพัฒนาระบบพลังงานภาคตะวันออก  
โทร. ๐ ๓๓๑๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒  
อีเมล: ewr@dw.mae.go.th

Green Industry "อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอนแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๒๓

ที่ อก ๐๒๒๐/ ๗ ๕๓ ๘ ลงวันที่ ๐๘ สิงหาคม ๒๕๖๗

ขอขยายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ

น้ำเสีย จำนวน ๑๔ รายการ

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

น้ำใต้ดิน จำนวน 3 รายการ

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

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method <sup>[5]</sup> 2) Instrumental Analyzer Method <sup>[9]</sup>
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>[5]</sup>
3	Opacity	Ringelmann's Method <sup>[5,4]</sup>
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>[8]</sup> 2) Instrumental Analyzer Method <sup>[10]</sup>
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Acid Method <sup>[5]</sup> 2) Instrumental Analyzer Method <sup>[11]</sup>
6	Sulfuric Acid	Isokinetic Sampling, Barium – Titrimetric Method <sup>[6]</sup>
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>[7]</sup>

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ที่อก ๐๓๑๐/ ๑๐๐๕๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๕ ตุลาคม ๒๕๖๕

เรื่อง แก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอนแอล เอส แอวราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง หนังสือ บริษัท เอนแอล เอส แอวราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด เลขที่ EN 2024/005

ลงวันที่ ๑๙ สิงหาคม ๒๕๖๕

ตามที่บริษัทที่อ้างถึง บริษัท เอนแอล เอส แอวราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอบึงสามพัน จังหวัดพะเยา ขอแก้ไขเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน เนื่องจากมีความคลาดเคลื่อน ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรม ได้รับทราบและดำเนินการแก้ไขรายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๕ ราย ตามที่แจ้งเวียนเรียบร้อยแล้ว เป็นดังนี้

ลำดับที่ ๒๗ นางพจนา สีดา

ลำดับที่ ๒๘ นายสุวณัฐ ภูทิววงศ์

ลำดับที่ ๓๐ นายชัชวาล สุบงกช

ลำดับที่ ๓๖ นายสุทธิศักดิ์ โชคดีสินธ์

ลำดับที่ ๔๒ นายกมลพล มณีสินพันธ์

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นายพรชัย กลิ่นกรวย)  
รองอธิบดี (ปฏิบัติ) สาขามลพิษ  
สิ่งแวดล้อมและสุขภาพ

ศูนย์วิจัยและพัฒนาระบบเทคโนโลยีสารสนเทศ

โทร. ๐ ๒๓๒๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

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 "อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่อก ๐๓๑๐(๒)/ ๔๒๔๖



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๐ พฤษภาคม ๒๕๖๕

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอนแอล เอส แอวราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด


อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๐ เมษายน ๒๕๖๕

ตามที่คำขอที่อ้างถึง บริษัท เอนแอล เอส แอวราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๒๓ สถานที่ตั้งเลขที่ ๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่ไม้ อำเภอบึงสามพัน จังหวัดพะเยา ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ออกให้เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑ ราย ได้แก่ นายปารมศ สัตยาคุณ ทะเบียนเลขที่ ๖-๑๒๓-๖๐๐๕๑

จึงเรียนมาเพื่อทราบ

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ที่ อก ๐๓๑๐(๓)/ ๕๕๐๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๗ พฤษภาคม ๒๕๖๘

เรื่อง เปลี่ยนแปลงชื่อ-สกุลบุคลากรของห้องปฏิบัติการวิเคราะห์

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อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
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จังหวัดระยอง ขอเปลี่ยนแปลงชื่อ-สกุลบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อ-สกุลบุคลากร จำนวน ๑ ราย  
จากนายณะสิทธิ์ วงศ์ชาโย เป็น นายอมลวิชัย วงศ์ชาโย

จึงเรียนมาเพื่อทราบ

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ศูนย์วิจัยและเฝ้าระวังมลพิษโรงงานภาคตะวันออก

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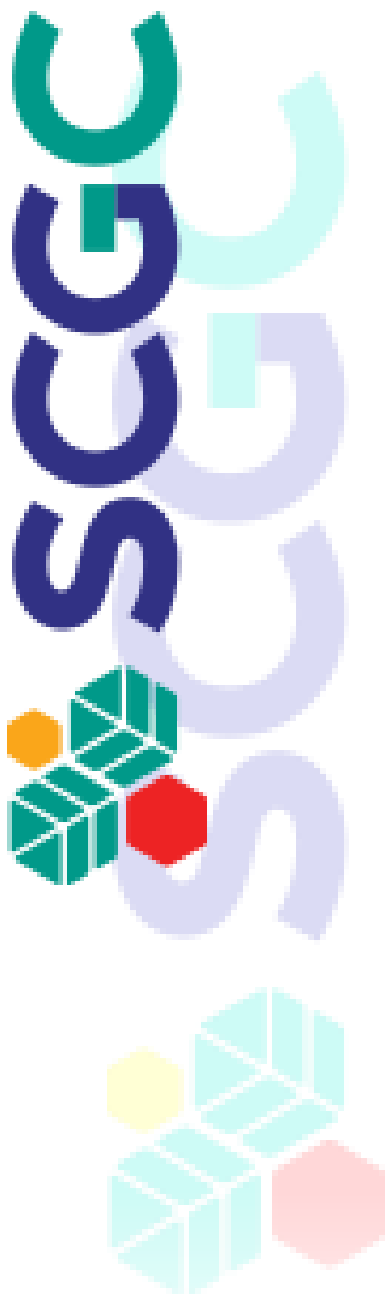
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