

ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือ

เอกสารสอบเทียบเครื่องมือ

ประจำเดือนกรกฎาคม พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 1901	Tisch Environmental, Inc.	05072022	5 Jul 22	4 Jul 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 159822	Innovative Instrument Co., Ltd.	23-AFM-203	27 Sep 23	26 Sep 24	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H756	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050148	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050149	UAE Consultant Co., Ltd.	01112023	1 Nov 23	31 Oct 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1200906875	UAE Consultant Co., Ltd.	03112023	3 Nov 23	2 Nov 24	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1200906876	UAE Consultant Co., Ltd.	09112023	9 Nov 23	8 Nov 24	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200636467	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200906880	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 KWWV1R96	UAE Consultant Co.,Ltd.	21122023	21 Dec 23	20 Dec 24	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 RATFJBXS	UAE Consultant Co.,Ltd.	21122023	21 Dec 23	20 Dec 24	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	InstanTel Inc.	Micromate UM11230	Calibration Laboratory Co.Ltd	Q23117018	20 Oct 23	19 Oct 24	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Quest Technologies, Inc	QC-20 QOF110030	Innovative Instrument Co.,Ltd.	23-ACT-116	4 Aug 23	3 Aug 24	-
20	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007304	Innovative Instrument Co.,Ltd.	23-SLM-285	29 Aug 23	28 Aug 24	-
21	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007311	Innovative Instrument Co.,Ltd.	23-SLM-296	6 Sep 23	5 Sep 24	-

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	July 5, 2022	Roots-meter S/N:	438320	Ta: 297 °K
Operator:	Jim Tisch	Pa:	750.1	mm Hg
Calibration Model #:	G25A	Calibrator S/N:	1901	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3540	3.3	2.00
2	3	4	1	0.9650	6.4	4.00
3	5	6	1	0.8640	8.0	5.00
4	7	8	1	0.8200	8.9	5.50
5	9	10	1	0.6780	12.9	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9859	0.7281	1.4073	0.9956	0.7353	0.8899
0.9818	1.0174	1.9902	0.9915	1.0274	1.2585
0.9797	1.1339	2.2251	0.9893	1.1451	1.4071
0.9785	1.1933	2.3337	0.9881	1.2050	1.4757
0.9732	1.4354	2.8146	0.9828	1.4496	1.7798

QSTD			QA		
m=	1.98897		m=	1.24546	
b=	-0.03691		b=	-0.02334	
r=	0.99996		r=	0.99996	

Calculations			
Vstd=	$\Delta Vol((Pa \cdot \Delta P) / Pstd) / (Tstd / Ta)$	Va=	$\Delta Vol((Pa \cdot \Delta P) / Pa)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime

For subsequent flow rate calculations:			
Qstd=	$1/m \left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} - b \right)$	Qa=	$1/m \left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION	
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30	

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.com
TOLL FREE: (877)263-7610
760-9009

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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. 0-2717-3000/24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1250
Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-W/M

Serial No.: -

ID No.: UAE.EFM.076/2566

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 10 April 2024

Reference: 2404-0118WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH2O

4.This instrument was used clean air as pressure media,

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure,

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level,

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

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

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No, Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] Attaporn Panurach

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Cert.No.: 24P1250
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure		High-port side		Low-port side		ΔP	Error
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00	0.00	0.00	0.00
4.00	2.00	-2.00	4.00	0.00	0.00	0.00	0.00
6.00	3.00	-3.00	6.00	0.00	0.00	0.00	0.00
8.00	4.00	-4.00	8.00	0.00	0.00	0.00	0.00
10.00	5.00	-4.95	10.00	0.00	0.00	0.00	0.00
12.00	6.00	-5.96	12.00	0.00	0.00	0.00	0.00
14.00	7.00	-6.95	14.00	0.00	0.00	0.00	0.00
16.00	8.00	-7.95	16.00	0.00	0.00	0.00	0.00
18.00	9.00	-8.95	18.00	0.00	0.00	0.00	0.00
20.00	10.00	-9.95	20.00	0.00	0.00	0.00	0.00
22.00	11.00	-10.95	22.00	0.00	0.00	0.00	0.00
24.00	12.00	-11.95	24.00	0.00	0.00	0.00	0.00
26.00	13.00	-12.95	26.00	0.00	0.00	0.00	0.00
28.00	14.00	-13.95	28.00	0.00	0.00	0.00	0.00
30.00	15.00	-14.95	30.00	0.00	0.00	0.00	0.00
32.00	16.00	-15.95	32.00	0.00	0.00	0.00	0.00
34.00	17.00	-16.95	34.00	0.00	0.00	0.00	0.00
36.00	18.00	-17.95	36.00	0.00	0.00	0.00	0.00

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7, UPH MED 13, SOI SEI NIPAKORN 11 TAMBON BANG KASEL
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2310-5800 FAX: 0660-2310-7140



Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Certificate No: 23-A3M-203
Request No: Req-2023-1919

Unit Under Calibration Details

Measurement Item: Air Flow Meter

Manufacturer: BGI

Model: Delta Cid DC1

Serial Number: 159822

ID: UAE.EFM.038/2561

Sensor Model: -

Sensor Serial Number: -

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: 7 September 2023

Calibration Date: 27 September 2023

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 Standard flow	19031011003	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qrchrom	27 February 2024
Pressure meter	CPG2400	41090KDU/651882	TPA	7 November 2023

Traceability:

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

Note:

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

Calibration By: Mr. Nopphon Luangrat
Service Calibration Engineer

Approved By: Mr. Panch Mahaveon
Calibration Engineer Supervisor
Issue Date: 27 September 2023

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Certificate No : 23-AFM-203
Request No : Req-2023-1919

Result of Calibration :

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)
24.90	100.64	14.58	14.50	-0.08	0.20
24.90	100.64	15.08	15.00	-0.06	0.21
25.00	100.63	15.90	15.80	-0.10	0.22
24.90	100.63	16.78	16.67	-0.11	0.23
24.90	100.63	18.46	18.30	-0.16	0.26

Note
STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 25.0 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

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

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

* Indicates non accredited

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 **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/19

Certificate of Calibration

Certificate No : 23-TPM-461
Request No : Req-2023-1919
Customer : UNITED ANALYST AND ENGINEERING
Name : CONSULTANT CO., LTD.
Address : 81 Soi Udumak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter Range Calibration : 20 °C to 50 °C
Manufacturer : BGI Type of Sensor : RTD
Model : Delta Cal DC1 Sensor Diameter (mm) : 3
Serial Number : 159822 Calibration Position (mm) : 45
Resolution : 0.1 °C Instrument Status : Used
ID Number : UAE.EFM.039/2561


Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 7 September 2023
Calibrated Date : 27 September 2023
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 0800057, ID: 02-TPM Which was calibrated on 27 February 2023, Calibration Certificate No. : QR23-0494
Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Noppadon Lungsart
Technical Manager
Issue Date : 27 September 2023

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FM-708-TPM-01 Rev.01 Issue date 13/02/20

Calibration Note : Certificate No : 23-TPM-461
UUC Adjustment : Not Adjust Request No : Req-2023-1919
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Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
Ts	20.033	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.033	30.1	-0.1	0.13
	35.034	35.1	-0.1	0.13
	40.040	40.0	0.0	0.13
	45.039	45.0	0.0	0.13
Tf	50.043	50.0	0.0	0.13
	20.033	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.033	30.1	-0.1	0.13
	35.034	35.2	-0.2	0.13
	40.040	40.2	-0.2	0.13
	45.039	45.2	-0.2	0.13
	50.043	50.2	-0.2	0.13

End of Certificate

Calibrated By : 
Mr. Sittichok Jitpakdeesakul

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FM-708-TPM-01 Rev.01 Issue date 13/02/20



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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 24P1367
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : -
Serial No. : -
ID No. : UAE-ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
81 Soi Udumak 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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


4.This result of calibration instrument was in absolute pressure.

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

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

7.This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory : 
[] Phalinee Prathpalpal
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration:- Without adjustment

Range: 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957,13	968,77	980,13	990,56	1001,26	1011,35	1022,10	1032,61
UUC* Indication (hPa)	960,0	970,0	980,0	990,0	1000,0	1010,0	1020,0	1030,0
Error (hPa)	2,87	1,23	-0,13	-0,56	-1,26	-1,35	-2,10	-2,61

Decreasing Pressure

Applied Pressure (hPa)	1032,61	1021,84	1010,88	1000,82	990,20	979,52	968,48	957,17
UUC* Indication (hPa)	1030,0	1020,0	1010,0	1000,0	990,0	980,0	970,0	960,0
Error (hPa)	-2,61	-1,84	-0,88	-0,82	-0,20	0,48	1,52	2,83

The uncertainty of measurement was $\pm 0,25$ hPa

* UUC = Unit Under Calibration

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

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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24H756
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE-ANV.131/2550

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Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024

Reference: 2404-0247WSC

Ambient Temperature: (25 \pm 3) °C

Relative Humidity: (50 \pm 20) %

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP402 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

2.The 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 maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No, Calibration 20058240

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No, Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :
[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

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Cert. No.: 24H756
Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (\pm %R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:-

Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (\pm °C)
20.007	20.5	0.493	0.72
25.032	25.0	-0.032	0.72
29.987	30.0	0.003	0.72
35.010	34.5	-0.510	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Nov 13, 2023

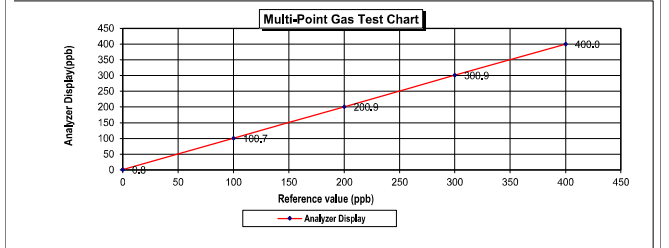
Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

Standard Gas Concentration

Standard Gas Concentration	Value	Unit	Dilutor Detail	Value
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,8	0,80	0,80
Level 2	20,00%	100,0	100,7	0,70	0,70
Level 3	40,00%	200,0	200,9	0,90	0,45
Level 4	60,00%	300,0	300,9	0,90	0,30
Level 5	80,00%	400,0	400,0	0,00	0,00
Remark : Measuring Range	500,0 ppb		Average Difference (%)		0,45
:Acceptable Limit $\pm 5\%$					



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13./Nov./2023

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13./Nov./2023

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

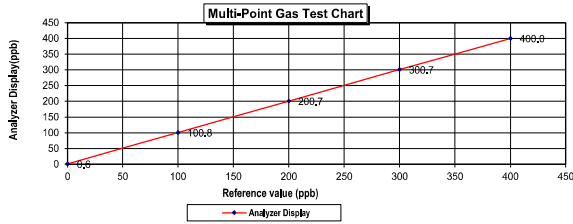
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050149

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.60	0.60	0.60
Level 2	20.00%	100.0	100.8	0.80	0.79	0.79
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		
				:Acceptable Limit \pm 5%		



Calculated by: [Signature] 01 / Nov / 2023

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 660

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards (May 2012)" document EPA 603/R-12/01, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are in a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104022308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APE1614048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMIS	15340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.9%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025

The SRM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet i550 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet i550 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet i550 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet i550 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

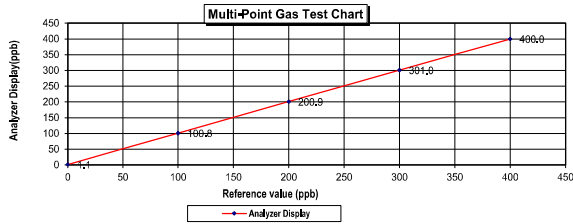
Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906875

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.1	1.10	1.10	1.10
Level 2	20.00%	100.0	100.8	0.80	0.79	0.79
Level 3	40.00%	200.0	200.9	0.90	0.45	0.45
Level 4	60.00%	300.0	301.0	1.00	0.33	0.33
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		
				:Acceptable Limit \pm 5%		



Calculated by: [Signature] 03 / Nov / 2023

MULTI-POINT GAS TEST REPORT

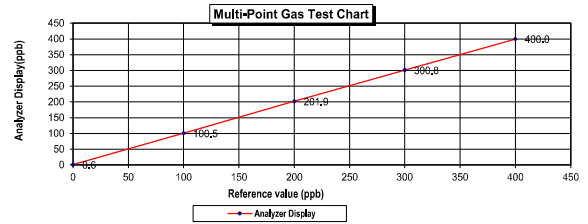
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906876

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.60	0.60	0.60
Level 2	20.00%	100.0	100.5	0.50	0.50	0.50
Level 3	40.00%	200.0	201.9	1.90	0.94	0.94
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		
				:Acceptable Limit \pm 5%		



Calculated by: [Signature] 9 / Nov / 2023

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.-
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,CO2,NO,NOX,SO2,BALNReference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Testability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	16340202002	E90130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The GRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200636467

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Dilutor Detail

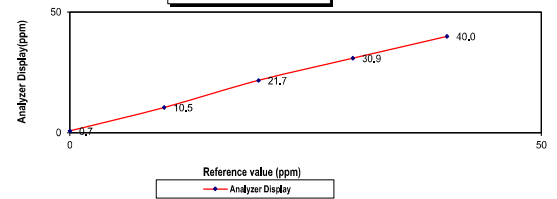
Manufacturer :	Thermo Scientific
Model :	146i
Serial Number :	1180540071

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.5	0.5	4.8
Level 3	40.00%	20.0	21.7	1.7	7.8
Level 4	60.00%	30.0	30.9	0.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm
:Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart



Page 1 of 1

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.-
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,CO2,NO,NOX,SO2,BALNReference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Testability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	16340202002	E90130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The GRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

Page 1 of 1

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 21, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : KWWV1R96

Standard Gas Concentration

Sulphur Dioxide (SO₂) : PPM
Nitric Oxide (NO) : PPM
Methane (CH₄) : 39,8 PPM
Carbon Monoxide (CO) : PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

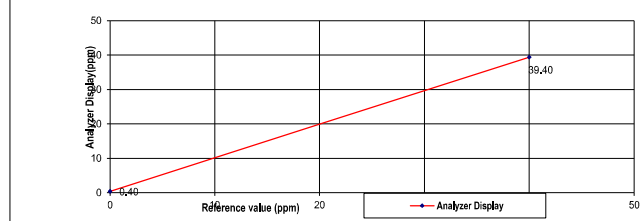
Dilutor Detail

Manufacturer :
Model :
Serial Number :

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,00	0,40	0,40	0,40
Level 2	80,00%	40,00	39,40	-1,52	1,52
Remark : Measuring Range	50,00 ppm		Average Difference (%)	0,96	
:Acceptable Limit \pm 5%					

Multi-Point Gas Test Chart



Calculate by
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..21...../..12...../..2023..

Approve by
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.....22...../..Dec...../..2023..

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 21, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : RATFJBXS

Standard Gas Concentration

Sulphur Dioxide (SO₂) : PPM
Nitric Oxide (NO) : PPM
Methane (CH₄) : 39,8 PPM
Carbon Monoxide (CO) : PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

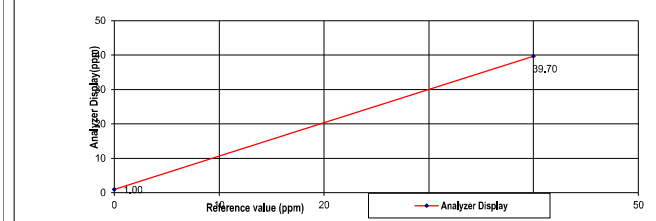
Dilutor Detail

Manufacturer :
Model :
Serial Number :

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	1,00	1,00	1,00	1,00
Level 2	80,00%	40,00	39,70	-0,76	0,76
Remark : Measuring Range	50,00 ppm		Average Difference (%)	0,88	
:Acceptable Limit \pm 5%					

Multi-Point Gas Test Chart



Calculate by
.....
..21...../..12...../..2023..

Approve by
.....
.....22...../..Dec...../..2023..

เอกสารไม่ควบคุม



Certificate Of Analysis

Special Gases Mixture

Customer Details
Name : United Analyst and Engineering Consultant Co., Ltd.
Address : 3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khwaeng Phra Khanong, Bangkok 10260
Customer Tag No. :

Certificate Details
Number : 3384/29
Date of Issue : 4-Aug-2020
Expiry date : 4-Aug-2028
Material Details
Production Order : 90161442
Material Code : 404400-AL-14
Cylinder No. : D824432
Gas content : 6.60 M³
Filling pressure : 137.0 bar
Valves : CGA 570 BRASS
Cylinder Owner : LINDE
Cylinder Size : 50 L

Laboratory Report
Component : Methane in Air
Nominal Concentration : 40.0 ppm
Analytical Result : 39.3 ppm
Uncertainty : \pm 1% relative
Method of Analysis : (S) + PG-11.2
Assay Date : 4-Aug-2020

Reference Standard used in Assay
Reference Standard : Methane in Nitrogen
Cylinder number : 2559956
Concentration : 49.29 \pm 0.39 ppm
Expiry date : 4-09-2020

Analytical Instruments used in Assay
Instrument/Make/Model : FTIR Spectrometers Nicolet 650
Analytical Principle : FTIR-CH4
Last Multi-point Calibration : 4-Aug-2020

Recommend usage condition
Minimum utilization : 5% of actual content or before expiry date whichever comes first.
Storage condition : Keep in well ventilation and secure area.

Comments
When reordering, please quote the material number

Note:
1. All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the OIML Recommendation (RPM 402/19-12/2011) for the Assay and Certification of Special Calibration Standards using gravimetric (G) method.
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor (k=2), providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to two National Standard of Mass in silicon enriched natural isotopic mixtures.
3. (1) Gas Chromatography, (2) Photoacoustic Spectroscopy, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Methane Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Panjapornchai
Signatory for and on behalf of Linde (Thailand) Co., Ltd.

Page 1 of 1
This report shall not be reproduced except in full.
Linde (Thailand) Public Company Limited
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Bangkok, Thailand 10110. Tel. (66) 2338-4100 Fax (66) 2338-4000
Head Office : 157 Asia Road 14, Bangkok 10110, Thailand
Tel. (66) 2338-4100 Fax (66) 2338-4000
Branch Office : 301 Asia Road 14, Bangkok 10110, Thailand
Tel. (66) 2338-4100 Fax (66) 2338-4000



CALIBRATION LABORATORY CO., LTD.

2110-11, 14, 55 Soi Prasert Manukul 29 Yaw 4, Prasert Manukul Rd., Ladprao, Bangkok 10230
Tel. 02-578-0353-4 Fax 02-578-2672 www.cclab.co.th E-mail: info@cclab.co.th



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230
CLID. NO. : 251701315
JOB CONTROL NO. : 231019117018

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 October 2023 DATE OF ISSUED : 25 October 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phanbusabong
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
25 October 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23117018
F3-011-04-01-12

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230
DATE OF CALIBRATION : 20 October 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter and Vibration Calibrator Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
3. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-23, Due Date 26 June 2024.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0136-22, Due Date 11 November 2023.
3. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 12 April 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2022)"

Certificate No. Q23117018

F3-011-04/01-12

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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	\pm (% of rdg.)
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.9
0.5	50 Hz		0.500	0.503	-0.003	1.9
0.6	50 Hz		0.600	0.603	-0.003	1.9
0.7	50 Hz		0.700	0.704	-0.004	1.9
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.504	-0.004	1.9
0.6	100 Hz		0.600	0.605	-0.005	1.9
0.7	100 Hz		0.700	0.706	-0.006	1.9

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
3	50 Hz	peak	3.000	3.033	-0.033	1.9
4	50 Hz		4.000	4.045	-0.045	1.9
5	50 Hz		5.000	5.057	-0.057	1.9
6	50 Hz		6.000	6.066	-0.066	1.9
7	50 Hz		7.000	7.081	-0.081	1.9
3	100 Hz	peak	3.000	3.039	-0.039	1.9
4	100 Hz		4.000	4.046	-0.046	1.9
5	100 Hz		5.000	5.055	-0.055	1.9
6	100 Hz		6.000	6.067	-0.067	1.9
7	100 Hz		7.000	7.079	-0.079	1.9

Certificate No. Q23117018

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	\pm (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.7
0.04	50 Hz		0.040	0.040	0.000	2.4
0.05	50 Hz		0.050	0.050	0.000	2.2
0.06	50 Hz		0.060	0.060	0.000	2.1
0.07	50 Hz		0.070	0.071	-0.001	2.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.7
0.04	100 Hz		0.040	0.040	0.000	2.4
0.05	100 Hz		0.050	0.050	0.000	2.2
0.06	100 Hz		0.060	0.061	-0.001	2.1
0.07	100 Hz		0.070	0.071	-0.001	2.1

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 009 Page 1,2 of 59

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23117018

F3-011-04/01-12

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 THF MOO 13, SOI SUTINAKORN 11 TAMBON BANG KADU,
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0860-2116-5860-1 FAX: 0660-2116-7140



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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 23-ACT-116

Request No : Req-2023-1545

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : QUEST
Model : QC-20
Serial Number : QOF110030
ID : UAE.EMA2.116/2555

Class : I
Range : 94, 114 dB / 250, 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : $(23 \pm 2) ^\circ\text{C}$
Humidity : $(50 \pm 20) \% \text{RH}$
Barometric Pressure : $(1013 \pm 10.0) \text{ hPa}$
Received Date : 21 July 2023
Calibration Date : 4 August 2023
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	31 May 2024
Sound Calibrator	AC-300	AC-300001087	EEI	23 May 2024
THD Multimeter	2015	1047765	NIMT	31 January 2024

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. Noppadol Luangset
Service Calibration Engineer

Approved By :
Mr. Nithavorn
Calibration Engineer Supervisor

Issue Date : 4 August 2023

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

เอกสารไม่ควบคุม

Certificate No : 23-ACT-116
Request No : Req-2023-1545

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.00	0.00	-	-	0.13	0.25
114 dB / 1000 Hz	113.90	-0.10	-	-	0.13	0.25
94 dB / 250 Hz	94.08	0.08	-	-	0.13	0.25
114 dB / 250 Hz	114.09	0.09	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	999.39	0.06	-	-	0.01	0.70
114 dB / 1000 Hz	999.35	0.06	-	-	0.01	0.70
94 dB / 250 Hz	250.74	0.30	-	-	0.01	0.70
114 dB / 250 Hz	250.72	0.29	-	-	0.01	0.70

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.25	-	0.40	2.5
114 dB / 1000 Hz	0.21	-	0.40	2.5
94 dB / 250 Hz	0.49	-	0.40	2.5
114 dB / 250 Hz	0.45	-	0.40	2.5

Note :

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

End of Calibration

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.

PM-709-SLM-01 Rev.0 Issue date: 1/7/19

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Certificate No : 23-SLM-285
Request No : Req-2023-1652

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT1
Serial Number : 003704
ID : UAEFMA372566
Resolution : 0.1 dB
Microphone Class : 1
Microphone Model : 377062
Microphone S/N : 34523
Preamplifier Model : PRMLX1T
Preamplifier S/N : 077639
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 7 August 2023
Calibrated Date : 29 August 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Questcal	EFA060234	25 July 2024	TSI
Audio Generator	Svanick	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 
Mr. Nopphol Luangrit
Calibration Officer

Approved By : 
Mr. Jiraporn Mathavorn
Calibration Engineer Supervisor
Issue Date : 29 August 2023

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.

PM-709-SLM-01 Rev.0 Issue date: 1/7/19

เอกสารไม่ควบคุม

Certificate No : 23-SLM-285
Request No : Req-2023-1652

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / 37-139							
Calibrator Setting	(dB)						
1000 Hz 114 dB	113.78	113.8	+0.02	113.9	+0.12	0.2	0.3

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.0	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.7	0.1
C	27.3	0.1
Z	31.6	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139					
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	0.1	0.2	0.2	0.6	1.0
8000 Hz	-0.4	-0.4	-0.3	0.7	+1.5, -2.5

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.

เอกสารไม่ควบคุม

PM-709-SLM-01 Rev.0 Issue date: 1/7/19

Certificate No : 23-SLM-285
Request No : Req-2023-1652

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	-0.1	-0.1	0.2	1.0
125 Hz	-0.1	0.0	-0.1		1.0
250 Hz	-0.1	-0.1	-0.1		1.0
500 Hz	-0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	0.0	0.0	0.0		1.0
4000 Hz	0.0	0.0	0.0	+1.5, -2.5	1.0
8000 Hz	-0.1	-0.1	0.0		+1.5, -2.5
16000 Hz	-0.1	-0.1	-0.1		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139					
UUC Weighting	(dB)				
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
37-139 / A					
UUC Time Response	(dB)				
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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.

เอกสารไม่ควบคุม

PM-709-SLM-01 Rev.0 Issue date: 1/7/19

Certificate No : 23-SLM-285
Request No : Req-2023-1652

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	0.8
134.00	134	134.0	0.0	0.8
129.00	129	129.0	0.0	0.8
124.00	124	124.0	0.0	0.8
119.00	119	119.0	0.0	0.8
114.00	114	114.0	0.0	0.8
109.00	109	109.0	0.0	0.8
104.00	104	104.0	0.0	0.8
99.00	99	99.0	0.0	0.8
94.00	94	93.9	-0.1	0.8
89.00	89	88.9	-0.1	0.8
84.00	84	83.9	-0.1	0.8
79.00	79	78.9	-0.1	0.8
74.00	74	73.9	-0.1	0.8
69.00	69	68.9	-0.1	0.8
64.00	64	63.9	-0.1	0.8
59.00	59	58.9	-0.1	0.8
54.00	54	53.9	-0.1	0.8
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	0.8
39.00	39	39.2	0.2	0.8
34.00	34	34.4	0.4	0.8
29.00	29	29.4	0.4	0.8
24.00	24	24.6	0.6	1.8

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

PM-700-SLM-01 Rev.0 Issue date: 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-285
Request No : Req-2023-1652

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	41.3	41.6	0.3	0.8
	114	114.0	0.0	0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Timeburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	0.5
	2	118.0	117.8	-0.2	+1.0, -1.5
	0.25	109.0	108.6	-0.4	+1.0, -3.0
Slow	200	128.6	128.5	-0.1	0.5
	2	109.0	108.9	-0.1	+1.0, -3.0
SEL	200	129.0	129.0	0.0	0.5
	2	109.0	109.0	0.0	+1.0, -1.5
	0.25	100.0	99.8	-0.2	+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	2.0
Positive half cycle	136.4	136.2	-0.20	1.0
Negative half cycle	136.4	136.2	-0.20	1.0

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

PM-700-SLM-01 Rev.0 Issue date: 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-285
Request No : Req-2023-1652

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.8		
Negative one-half cycle	141.8		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.1

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

PM-700-SLM-01 Rev.0 Issue date: 1/7/19.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok.
10260

Certificate No : 23-SLM-296
Request No : Req-2023-1854

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT1
Serial Number : 0007311
ID : UAE.EFM.043/2566
Resolution : 0.1 dB

Microphone Class : 1
Microphone Model : 377B02
Microphone S/N : 345817
Preamplifier Model : PRMLXT1
Preamplifier S/N : 077646
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2023
Calibrated Date : 6 September 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA060234	25 July 2024	TSI
Audio Generator	Svante	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangrat
Calibration Officer

Approved By : 
Mr. Noppadon Luangrat
Calibration Engineer Supervisor
Issue Date : 6 September 2023

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

PM-700-SLM-01 Rev.0 Issue date: 1/7/19.

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

PM-700-SLM-01 Rev.0 Issue date: 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-296
Request No : Req-2023-1854

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust			After Adjust		UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR		UUC	ERR		Limit
Calibrator Setting	(dB)	(dB)	(dB)		(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114 dB	113.78	114.0	+0.22		113.8	+0.02	0.2	0.3

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.0	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.5	0.1
C	27.5	0.1
Z	31.9	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z		Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.2	0.2	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	-0.2	-0.1	-0.1	0.6	1.0
8000 Hz	-0.7	-0.7	-0.5	0.7	+1.5 -2.5

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
PM-308-SLM-01 Rev.0 Issue Date 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-296
Request No : Req-2023-1854

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A (dB)	C (dB)	Z (dB)	(± dB)	Limit
STD Setting					
63 Hz	-0.2	-0.1	-0.1	0.2	1.0
125 Hz	-0.1	0.0	-0.1		1.0
250 Hz	-0.1	-0.1	-0.1		1.0
500 Hz	-0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	0.0	0.0	0.0		1.0
4000 Hz	0.0	0.0	0.0		1.0
8000 Hz	-0.1	-0.1	0.0		+1.5 -2.5
16000 Hz	-0.1	-0.1	-0.1		+2.5 -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / 37-139	REF	UUC	ERR	(± dB)	Limit
UUC Weighting	(dB)	(dB)	(dB)		(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
37-139 / A	REF	UUC	ERR	(± dB)	Limit
UUC Time Response	(dB)	(dB)	(dB)		(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
PM-308-SLM-01 Rev.0 Issue Date 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-296
Request No : Req-2023-1854

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	(± dB)	Limit
STD dB	(dB)	(dB)	(dB)		(± dB)
139.00	139	139.0	0.0	0.3	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	93.9	-0.1		0.8
89.00	89	88.9	-0.1		0.8
84.00	84	83.9	-0.1		0.8
79.00	79	78.9	-0.1		0.8
74.00	74	73.9	-0.1		0.8
69.00	69	68.9	-0.1		0.8
64.00	64	63.9	-0.1		0.8
59.00	59	58.9	-0.1		0.8
54.00	54	53.9	-0.1		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.3	0.3		0.8
34.00	34	34.4	0.4		0.8
29.00	29	29.3	0.3		0.8
24.00	24	24.6	0.6		1.8

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
PM-308-SLM-01 Rev.0 Issue Date 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-296
Request No : Req-2023-1854

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
41.3	41.5	0.2		0.8	
114	114.0	0.0		0.3	0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	135.0	135.0	0.0	0.2	0.5
	2	118.0	117.7	-0.3		+1.0 -1.5
	0.25	109.0	108.6	-0.4		+1.0 -3.0
Slow	200	128.6	128.3	-0.1		0.5
	2	109.0	108.9	-0.1		+1.0 -3.0
SEL	200	129.0	129.0	0.0		0.5
	2	109.0	109.0	0.0		+1.0 -1.5
	0.25	100.0	99.9	-0.1		+1.0 -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	137.4	136.6	-0.80	0.2	2.0
Positive half cycle	136.4	136.1	-0.30		1.0
Negative half cycle	136.4	136.1	-0.30		1.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
PM-308-SLM-01 Rev.0 Issue Date 1/7/19.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-296

Request No : Req-2023-1854

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	139.9		
Negative one-half cycle	139.9		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.1

End of Certificate



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by :
Approved by :
() Ponpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used : Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Cert.No.: 24MM292
Page: 2 of 3

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15864	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certificate is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

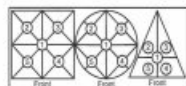
1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading (g)
0.0001

2. Effect of off center loading
A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร
ศูนย์บริการทดสอบวิชาการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-C5-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 2 of 4**

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	MC394535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

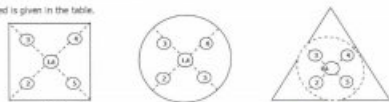
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.000000	0.000000	0.000000	0.0000008	2.00
0.001	0.001003	0.001001	-0.000001	0.0000091	2.00
0.005	0.005003	0.004999	-0.000004	0.0000094	2.00
0.01	0.010003	0.010000	-0.000003	0.0000091	2.00
0.05	0.049996	0.050000	0.000004	0.0000098	2.00
0.1	0.100011	0.100000	-0.000011	0.0000111	2.00
0.5	0.500018	0.500001	-0.000017	0.0000134	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000002	-0.000015	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000031	20.000002	-0.000029	0.000037	2.00
30	30.000040	30.000003	-0.000037	0.000052	2.00
50	50.000078	50.000004	-0.000074	0.000068	2.00
80	80.000068	80.000005	-0.000063	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.000010	90.000002	-0.000008	0.000015	2.00
100	100.000006	100.000000	-0.000006	0.000015	2.00
110	110.000007	110.000001	-0.000006	0.000017	2.00
120	120.000009	120.000000	-0.000009	0.000018	2.00
130	130.000010	130.000000	-0.000010	0.000019	2.00
140	140.000014	140.000000	-0.000014	0.000020	2.00
150	150.000009	150.000000	-0.000009	0.000020	2.00
160	160.000010	160.000000	-0.000010	0.000022	2.00
170	170.000012	170.000000	-0.000012	0.000023	2.00
200	200.000016	200.000000	-0.000016	0.000028	2.00

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL: 0-2717-3900 FAX: 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

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 : Walailak Sirthean

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saitthip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39

Page.: 2 of 2

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

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

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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เอกสารไม่

Verification Certificate**Certificate No.:**

2304455-001-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address:3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment:

Digestion Unit (Heating Block)

Manufacturer:

VELP SCIENTIFICA

Model:

DKL20

Serial No.:

213517

ID No.:

UAE.WAS.005/2555

Order No.:

2304455

Operation No.:

2304455-001

Date of Receipt:

28 August 2023

Date of Calibration:

28-29 August 2023

Calibrated byMr. Manas Somsak
Specialist**Approved by**

(Mr. Phraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue:

1 September 2023

Responsible for the Technical Management Team

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-C5-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Verification Report**Certificate No.:**

2304455-001-01

Equipment:

Digestion Unit (Heating Block)

Model: DKL20

Serial No.: 213517

Resolution: 1 °C ID No.: UAE.WAS.005/2555

Manufacturer: VELP SCIENTIFICA

Date of Calibration:

28-29 August 2023

Page 2 of 4

Location:

Dry Laboratory (312), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Environment Condition:

Ambient Temperature (28 ± 1) °C

Relative Humidity (56 ± 3) %

Line Voltage (224 ± 2) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its Digestion blocks and Calibration according to NFI Method W-TE-026 based on BS 4309 : 1968
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	3497DA	MY44045576/MY41194E3	TC23/0048	2-Jun-2024	N.M. Technical Center Laboratory
	Type R	R/CH1 to R/CH3			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC* Description

Time of Record 1 Hour 6 Minute At 380 °C

7. Result of Calibration :☒

Without adjustment

☐

After adjustment

F-C5-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Verification Report**Certificate No.:**

2304455-001-01

Equipment:

Digestion Unit (Heating Block)

Model: DKL20

Serial No.: 213517

Resolution: 1 °C ID No.: UAE.WAS.005/2555

Manufacturer: VELP SCIENTIFICA

Date of Calibration:

28-29 August 2023

Page 3 of 4

Calibration point:

380 °C

Calibration result:**Table 1 : Reporting of Temperature**

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.16	378.59	2.0
2	380	380	0.18	378.65	2.0
3	380	380	0.18	381.62	2.0
4	380	380	0.24	380.23	2.0
5	380	380	0.26	379.86	2.0
6	380	380	0.26	380.93	2.0
7	380	380	0.25	381.11	2.0
8	380	380	0.19	382.35	2.0
9	380	380	0.26	381.55	2.0
10	380	380	0.25	380.20	2.0
11	380	380	0.29	382.08	2.0
12	380	380	0.19	382.26	2.0
13	380	380	0.19	382.26	2.0
14	380	380	0.21	382.15	2.0
15	380	380	0.12	382.15	2.0
16	380	380	0.20	381.91	2.0
17	380	380	0.15	381.09	2.0
18	380	380	0.13	381.42	2.0
19	380	380	0.13	381.77	2.0
20	380	380	0.29	382.08	2.0

Note:

- UUC* = Unit Under Calibration

- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.

- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

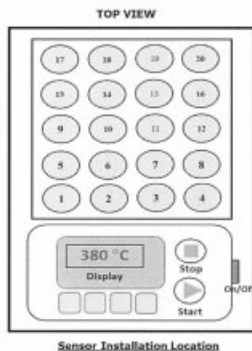
F-C5-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2304455-001-01
Equipment: Digestion Unit (Heating Block)
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VLP SCIENTIFICA
Date of Calibration: 28-29 August 2023 Page 4 of 4
Calibration point: 380 °C
Calibration result: Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



***** End *****

F-05-012 Revision: 01 Date: 20-04-65

2008 บ่อประมงสุพรรณ 35 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100
2009 บ่อประมงสุพรรณ 35 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100
2009 บ่อประมงสุพรรณ 35 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100 บ่อประมงสุพรรณ 100
Tel: 06600 2422 8888 Fax: 06600 2422 8545

เอกสารไม่ควบคุม

(nfi.com)



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.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10280
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 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.

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6

Cert. No.: 24TM647
Page : 2 of 3

Procedure Used :-

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	MY49023932	23LM122	TPA	26 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)

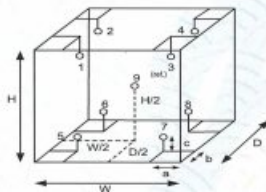
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
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
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	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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เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date:	9 Feb 2024	Report No:	9810
Customer:	UAE	Address:	BANGKOK
Instrument:	K7100	Serial:	91790524
Hours Start	09:30	Travel To Customer	1hr
Hours Finish	09:30	Labour	09:30 18:00 2.5hrs
		Travel From Customer	16:30 2hrs

Application		Special		Job Type		Standard	
Normal	x	Courtesy Visit	x	Installation	x	Training	x
Distributor	x	PMA Onboarding	x	Quote	x	In House	x
Internal	x	Warranty	x	Repair	x	PM	x
Digital Service	x	Sales Support	x	Remote	x	Other	x

PO/Quote Number: If applicable

PMA Type: FOSSETHC If applicable Contract No. If applicable

Details of Work / Test		Condition / Status
# PM K7100		
- ตรวจสอบเครื่องวัด pH		
- ตรวจสอบเครื่องวัด Salinity 3 pin 100 mL		
- Salinity 50 mL - 20 mL		
- ตรวจสอบเครื่องวัด pH kit		
- ตรวจสอบเครื่องวัด Salinity		
# 10000 325 SPSH Neck Complete 1 PC		
Instrument Ready for Use		OK Not OK If not OK - Comment

Part No.	Batch	Description	Qty
10009965	14.12.2020	Foss pH kit lot 1000 10000 325 SPSH Neck Complete 1 PC	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name
Would you be willing to participate in a brief survey in order to tell us how we performed? Email	

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date:	8-Feb-2024	Report No:	9807
Customer:	UAE	Address:	BANGKOK
Instrument:	K7100	Serial:	91879052
Hours Start	09:30	Travel To Customer	1.5hrs
Hours Finish	09:30	Labour	09:30 18:00 2.5hrs
		Travel From Customer	16:00 15:00 2hrs

Application		Special		Job Type		Standard	
Normal	x	Courtesy Visit	x	Installation	x	Training	x
Distributor	x	PMA Onboarding	x	Quote	x	In House	x
Internal	x	Warranty	x	Repair	x	PM	x
Digital Service	x	Sales Support	x	Remote	x	Other	x

PO/Quote Number: If applicable

PMA Type: FOSSETHC If applicable Contract No. If applicable

Details of Work / Test		Condition / Status
# PM K7100		
- ตรวจสอบเครื่องวัด pH		
- ตรวจสอบเครื่องวัด Salinity 3 pin 100 mL		
- Salinity 50 mL - 20 mL		
- ตรวจสอบเครื่องวัด pH kit		
- ตรวจสอบเครื่องวัด Salinity		
# 10000 325 SPSH Neck Complete 1 PC		
Instrument Ready for Use		OK Not OK If not OK - Comment

Part No.	Batch	Description	Qty
60031807	13-10-2023	Foss pH kit 8100/8100 12-2020	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name
Would you be willing to participate in a brief survey in order to tell us how we performed? Email	

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 24CH319
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HAOC0025
ID No. : UAE.EFM.117/2563(EFM.pH.07/63)
Condition As-Received: Used Item
Received Date : 12 March 2024
Calibration Date : 14 March 2024
Reference : 2403-0386WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure :
In-house method :
- CP-CHS by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CHS by comparison with temperature standard

Calibrated by : Warakorn Lemagatrakul

Approved by :

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 15 March 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.

A 0064529



Cert.No.: 24CH319
Page: 2 of 3

Condition of this calibration result

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 4.006	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 Document Process Calibrator at pH (4.7/7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: HAOC0025	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	10.00	-177.48	-177.5	10.01	0.058	2.00

a 1206341



Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N:-	4.008	4.01	149.4	0.0091	2.07
	6.986	7.00	-25.1	0.0093	2.00
	6.986	7.02	-24.3	0.011	2.00
	9.997	10.01	-199.5	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : -

Dimension of probe

- Length : 103 mm,

- Diameter : 16 mm.

- Immersion Depth : 90 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.002	35.0	-0.002	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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เอกสารสอบเทียบเครื่องมือ

ประจำเดือนสิงหาคม พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3541	Jiranatee Associates Co., Ltd.	CL-012-65	31 Oct 22	30 Oct 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 163268	Innovative Instrument Co., Ltd.	23-AFM-211	4 Oct 23	3 Oct 24	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H756	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920005	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920006	UAE Consultant Co., Ltd.	01112023	1 Nov 23	31 Oct 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i JC1606001758	UAE Consultant Co., Ltd.	09112023	9 Nov 23	8 Nov 24	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1191503040	UAE Consultant Co., Ltd.	09112023	9 Nov 23	8 Nov 24	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-69160-362	UAE Consultant Co., Ltd.	08112023	8 Nov 23	7 Nov 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-73881-375	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 SSGEYBJ	UAE Consultant Co.,Ltd.	15122023	15 Dec 23	14 Dec 24	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 VV2FY3R3	UAE Consultant Co.,Ltd.	15122023	15 Dec 23	14 Dec 24	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14465	Calibration Laboratory Co.Ltd	Q23117019	20 Oct 23	19 Oct 24	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV36 107224	Innovative Instrument Co.,Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
20	Sound Level Meter	$L_{Aeq} 1\text{ hr}$, $L_{Aeq} 24\text{ hrs}$, L_{Amax} , L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007310	Electrical And Electronics Institute Foundation For Industrial Development	CP20240289EA	5 Aug 24	4 Aug 25	-
21	Sound Level Meter	$L_{Aeq} 1\text{ hr}$, $L_{Aeq} 24\text{ hrs}$, L_{Amax} , L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007312	Electrical And Electronics Institute Foundation For Industrial Development	CP20240288EA	5 Aug 24	4 Aug 25	-

CERTIFICATE OF CALIBRATION

Certificate No. : CL-012-65

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TSCN
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3541
ID NUMBER : UAE.EFM.177/2561
CONDITION AS-RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

Calibration procedure:
The Orifice gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G65/MC/W2-00. The W-2-004
was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the
measurement to recognized the national
standards and to realization of the international
system of units (SI) through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: 02215902

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)

RECEIVED DATE : 25 Oct 2022
MEASUREMENT DATE : 31 Oct 2022
ISSUE DATE : 02 Nov 2022

ENVIRONMENTAL CONDITIONS:

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.7 °C and 62.2 %RH.

TABULATION OF RESULTS:

The table on next page give the measured values.



Approved signatory: Mr. Pinyas Booncharoen
Calibration Department Manager

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Qs] m^3/min
1	0.700	756.152	24.690	24.150	56.497	1.688	1.296	0.647
2	1.001	756.144	24.650	24.100	60.829	3.430	1.843	0.919
3	1.119	756.100	24.670	24.080	41.077	4.527	2.123	1.056
4	1.169	756.072	24.580	24.130	30.350	5.100	2.214	1.119
5	1.417	756.087	24.300	23.850	29.843	7.540	2.742	1.359

Slope (m): 2.02990
Intercept (b): -0.01831
Correlation coefficient (r): 0.99973
Uncertainty (k=2): 0.012 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Qs] m^3/min
1	0.700	756.152	24.690	24.150	56.497	1.688	0.815	0.649
2	1.001	756.144	24.650	24.100	60.829	3.430	1.139	0.922
3	1.119	756.100	24.670	24.080	41.077	4.527	1.335	1.060
4	1.169	756.072	24.580	24.130	30.350	5.100	1.417	1.123
5	1.417	756.087	24.300	23.850	29.843	7.540	1.722	1.363

Slope (m): 1.27542
Intercept (b): -0.01152
Correlation coefficient (r): 0.99973
Uncertainty (k=2): 0.013 m^3/min

End of Certificate of Calibration



THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS GIVEN IN WRITING FROM THE LABORATORY

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เอกสารไม่ควบคุม



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

Certificate of Calibration

Certificate No. : 24P1250
Page : 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No. : -
ID No. : UAE.EFM.078/2566

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 10 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using "DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

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

- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Prathapal
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1250
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range : 0 inH₂O to 36 inH₂O
Scale Interval : 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-4.95	10.00	0.00
12.00	6.00	-5.95	12.00	0.00
14.00	7.00	-6.95	14.00	0.00
16.00	8.10	-7.95	16.05	0.05
18.00	9.10	-8.95	18.05	0.05
20.00	10.10	-9.95	20.05	0.05
22.00	11.10	-10.95	22.05	0.05
24.00	12.10	-11.95	24.05	0.05
26.00	13.15	-12.95	26.10	0.10
28.00	14.15	-13.95	28.10	0.10
30.00	15.20	-14.95	30.15	0.15
32.00	16.20	-15.95	32.15	0.15
34.00	17.20	-16.95	34.15	0.15
35.50	18.00	-17.70	35.70	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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เอกสารไม่ควบคุม

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-AFM-211
Request No : Req-2023-2070

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
ID : UAE.EFM.174/2561
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 : 29 September 2023
Calibration Date : 4 October 2023
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 Standard flow	19031011003	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qredera	27 February 2024
Pressure meter	CPG2400	41000KDU/631882	TPA	7 November 2023

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. Neppanum Luangart
Service Calibration Engineer

Approved By : 
Mr. Pichit Malavorn
Calibration Engineer Supervisor
Issue Date : 4 October 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/23

Certificate No : 23-AFM-211
Request No : Req-2023-2070

Result of Calibration :

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)
23.90	100.76	14.40	14.50	0.10	0.20
23.90	100.75	14.91	15.00	0.09	0.21
24.80	100.90	15.72	15.80	0.08	0.22
23.80	100.77	16.58	16.67	0.09	0.23
23.70	100.78	18.23	18.30	0.07	0.26

Note
STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 25.0 °C, 101.3 kPa, Air
- 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 not accredited

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 lab. **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/23

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/23

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-TPM-475
Request No : Req-2023-2070
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
Resolution : 0.1 °C
ID Number : UAE.EFM.174/2561

Range Calibration : 20 °C to 50 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 29 September 2023
Calibrated Date : 4 October 2023
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard
Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 27 February 2023, Calibration Certificate No. : QR23-0494

Traceability
This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Neppanum Luangart
Technical Manager
Issue Date : 5 October 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-TPM-01 Rev.01 Issue date 13/02/23

Calibration Note
UUC Adjustment : Not Adjust

Certificate No : 23-TPM-475
Request No : Req-2023-2070
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
Ta	20.035	19.9	+ 0.1	0.13
	25.034	24.9	+ 0.1	0.13
	30.033	30.1	- 0.1	0.13
	35.035	35.2	- 0.2	0.13
	40.041	40.2	- 0.2	0.13
	45.042	45.2	- 0.2	0.13
Tt	50.045	50.2	- 0.2	0.13
	20.035	19.9	+ 0.1	0.13
	25.034	24.9	+ 0.1	0.13
	30.033	30.1	- 0.1	0.13
	35.035	35.1	- 0.1	0.13
	40.041	40.1	- 0.1	0.13
	45.042	45.1	- 0.1	0.13
	50.045	50.1	- 0.1	0.13

End of Certificate

Calibrated By : 
Mr. Sittichok Jongsakdiensakul

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-TPM-01 Rev.01 Issue date 13/02/23

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-TPM-01 Rev.01 Issue date 13/02/23



Certificate of Calibration

Certificate No. : 24P1367
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4.This result of calibration instrument was in absolute pressure.

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] Attapol Panurach

เอกสารไม่ควบคุม



Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval : 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No. : 24H756
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.131/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

2.The 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 maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :
[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

เอกสารไม่ควบคุม

Result of Calibration:-

Without Adjustment

Function:

Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:-

Without Adjustment

Function:

Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.0	-0.032	0.72
29.997	30.0	0.003	0.72
35.010	34.5	-0.510	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

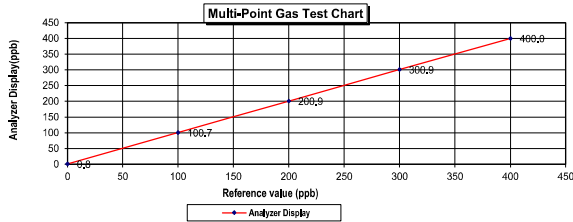
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,8	0,80	0,80	0,80
Level 2	20,00%	100,0	100,7	0,70	0,70	0,70
Level 3	40,00%	200,0	200,9	0,90	0,45	0,45
Level 4	60,00%	300,0	300,9	0,90	0,30	0,30
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb		Average Difference (%)		0,45



MULTI-POINT GAS TEST REPORT

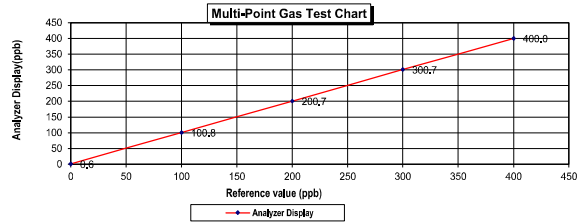
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050149

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.60	0.60	0.60
Level 2	20,00%	100.0	100.8	0.80	0.79	0.79
Level 3	40,00%	200.0	200.7	0.70	0.35	0.35
Level 4	60,00%	300.0	300.7	0.70	0.23	0.23
Level 5	80,00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.40



Airgas Specialty Gases
Airgas USA LLC
6141 Station Road
Plumsteadville, PA 19049
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	$\pm 0.9\%$ NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	$\pm 0.9\%$ NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	$\pm 1.4\%$ NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	$\pm 0.3\%$ NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	$\pm 1.2\%$ NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	$\pm 0.3\%$	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	$\pm 1.5\%$	Feb 17, 2023
GMIS	16340202002	EB0130037	9.993 PPM NITROGEN DIOXIDE/NITROGEN	$\pm 1.6\%$	Sep 29, 2025
NTRM	160102-22	KAL000820	97.99 PPM SULFUR DIOXIDE/NITROGEN	$\pm 0.8\%$	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.3\%$	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	$\pm 0.6\%$	May 14, 2025

The NTRM, NTRM, PRM, or ROW noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023



MULTI-POINT GAS TEST REPORT

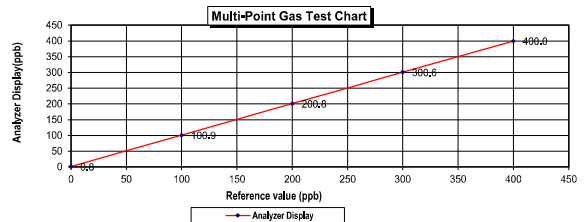
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : JC1606001758

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.80	0.80
Level 2	20.00%	100.0	0.90	0.89	0.89
Level 3	40.00%	200.0	0.80	0.40	0.40
Level 4	60.00%	300.0	0.60	0.20	0.20
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.46



MULTI-POINT GAS TEST REPORT

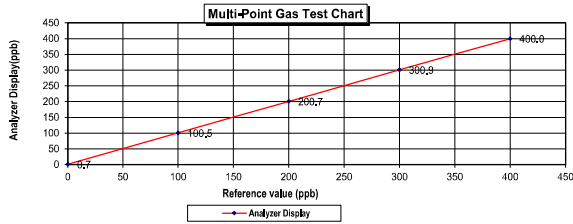
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1191503040

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,7	0,70	0,70	0,70
Level 2	20,00%	100,0	100,5	0,50	0,50	0,50
Level 3	40,00%	200,0	200,7	0,70	0,35	0,35
Level 4	60,00%	300,0	300,9	0,90	0,30	0,30
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb		Average Difference (%)		0,37



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CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 560

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards (May 2012)" document EPA 603/R-12/01, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1614048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.9%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 PPM CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The SWM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

Approved for Release

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MULTI-POINT GAS TEST REPORT

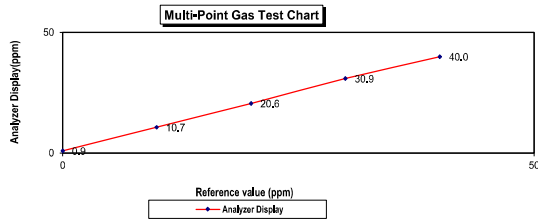
Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-69160-362

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,9	0,9	0,9	0,9
Level 2	20,00%	10,0	10,7	0,7	6,5	6,5
Level 3	40,00%	20,0	20,6	0,6	2,9	2,9
Level 4	60,00%	30,0	30,9	0,9	2,9	2,9
Level 5	80,00%	40,0	40,0	0,0	0,0	0,0
Remark : Measuring Range		50,0 ppm	Average Difference (%)		2,65	



เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

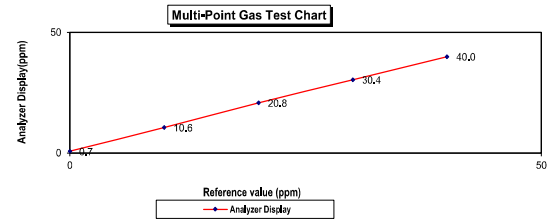
Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-73881-375

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,7	0,7	0,7	
Level 2	20,00%	10,0	0,6	5,7	5,7	
Level 3	40,00%	20,0	0,8	3,8	3,8	
Level 4	60,00%	30,0	0,4	1,3	1,3	
Level 5	80,00%	40,0	0,0	0,0	0,0	
Remark : Measuring Range		50,0 ppm	Average Difference (%)		2,30	



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CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

LTD--

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO,CO2,NO,NOX,SO2,BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 560

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with EPA Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	16340202002	E90130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 07, 2027
CO	230603	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iSSO FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iSSO FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iSSO FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iSSO FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

MULTI-POINT GAS TEST REPORT

Test Date : Dec 15, 2023

Equipment : Hydrocarbon Analyzer

Model : APHA-370

Manufacturer : HORIBA

Serial Number : SSGEYBJ

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	-	PPM
Nitric Oxide (NO)	-	PPM
Methane (CH ₄)	39.8	PPM
Carbon Monoxide (CO)	-	PPM
Cylinder No. :	D824432	
Expiration Date :	Aug 4, 2028	

Dilutor Detail

Manufacturer :	
Model :	
Serial Number :	

Multi-point gas test data

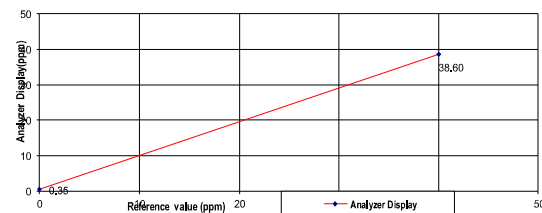
Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.00	0.35	0.35	0.35
Level 2 80,00%	40.00	-1.40	-3.63	3.63

Remark : Measuring Range 50.00 ppm

Average Difference (%) 1.99

:Acceptable Limit ± 5%

Multi-Point Gas Test Chart



.....15...../.....12...../.....2023.

.....16...../.....Dec...../.....2023.

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 15, 2023

Equipment : Hydrocarbon Analyzer

Model : APHA-370

Manufacturer : HORIBA

Serial Number : VV2FY3R3

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	-	PPM
Nitric Oxide (NO)	-	PPM
Methane (CH ₄)	39.8	PPM
Carbon Monoxide (CO)	-	PPM
Cylinder No. :	D824432	
Expiration Date :	Aug 4, 2028	

Dilutor Detail

Manufacturer :	
Model :	
Serial Number :	

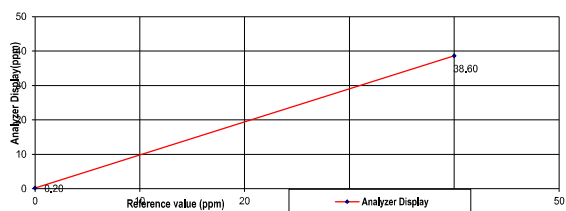
Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.00	0.20	0.20	0.20
Level 2 80,00%	40.00	-1.40	-3.63	3.63

Remark : Measuring Range 50.00 ppm

:Acceptable Limit ± 5%

Multi-Point Gas Test Chart



.....15...../.....12...../.....2023.

.....16...../.....Dec...../.....2023.

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Certificate Of Analysis

Special Gases Mixture

Customer Details	Name:	United Analyst and Engineering Co., Ltd.	Address:	3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khet Phra Khanong, Bangkok 10260	Customer Tag No.:	
Certificate Details	Number:	3184/20	Date of Issue:	4-Aug-2020	Expiry date:	4-Aug-2028
Material Details	Production Order:	90161442	Material Code:	400400-AL-34	Cylinder No.:	D824432
Gas content:	6.60 M ³	Filling pressure:	137.0 bar	Valves:	CSA 590 BRASS	SD1
Laboratory Details	Cylinder Material:	ALUMINUM	Cylinder Size:			

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Methane in Air	40.0 ppm	39.8 ppm	± 1% relative	(6) + PB-512	4-Aug-2020

Reference Standard	Cylinder number	Concentration	Expiry date:
Methane in Nitrogen	25319956	47.25 ± 0.39 ppm	3-Oct-2023

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iSSO	FTIR-CH4	4-Aug-2020

Recommend usage condition

Minimum utilization : 5% of actual content or before expiry date whichever comes first.

Storage condition : keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

- All results expressed in this report are on molar/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Testability Protocol (EPA-600/R-12/031) for the Assay and Certification of Gaseous Calibration Standards using gravimetric.
- The reported impurity level is based on a standard uncertainty multiplied by a coverage factor of 2, providing a level of confidence of approximately 95%. The impurity level of this material is traceable to the SI through the reference gas standard which is traceable to two National Standard of Mass or other recognized calibration and/or gravimetric.
- (1) Gas Chromatography, (2) Photographic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Molecular Analyzer, (5) Test Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parikayapornchai
Signatory for and on behalf of Linde (Thailand) Co., Ltd.

PB 002/1006

Linde (Thailand) Public Company Limited/ลิ้นดี (ประเทศไทย) จำกัด

157 Flou, Bangna Tower 4, 125 Moo 14, Bangna Sub Div. 4,3 Road, Bangnae

Bangkok, Sattapattana District, Tel. (662) 238-6100 Fax (662) 238-6133

Bangkok Head Office 1, Chongnaphon, Asoke Intersection, Chongnaphon 24390

Thailand, Tel (662) 26370-6770-61 Fax (662) 26370-6133



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14465/UM14465
CLID. NO. : 252000712
JOB CONTROL NO. : 231019117019

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 October 2023

DATE OF ISSUED : 25 October 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
25 October 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23117019
F3-011-04/01-12

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เอกสารไม่ควบคุม

qcalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14465/UM14465
DATE OF CALIBRATION : 20 October 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline. The calibration was performed by using Digital Multimeter, Programmable Timer/Counter and Vibration Calibrator Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
- Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-23, Due Date 26 June 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0136-22, Due Date 11 November 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 12 April 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23117019
F3-011-04/01-12

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เอกสารไม่ควบคุม

qcalibration



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	\pm (% of rdg.)
0.3	50 Hz	peak	0.300	0.307	-0.007	1.9
0.4	50 Hz		0.400	0.407	-0.007	1.9
0.5	50 Hz		0.500	0.508	-0.008	1.9
0.6	50 Hz		0.600	0.609	-0.009	1.9
0.7	50 Hz		0.700	0.710	-0.010	1.9
0.3	100 Hz	peak	0.300	0.307	-0.007	1.9
0.4	100 Hz		0.400	0.408	-0.008	1.9
0.5	100 Hz		0.500	0.509	-0.009	1.9
0.6	100 Hz		0.600	0.609	-0.009	1.9
0.7	100 Hz		0.700	0.710	-0.010	1.9

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
3	50 Hz	peak	3.000	3.059	-0.059	1.9
4	50 Hz		4.000	4.068	-0.068	1.9
5	50 Hz		5.000	5.079	-0.079	1.9
6	50 Hz		6.000	6.089	-0.089	1.9
7	50 Hz		7.000	7.097	-0.097	1.9
3	100 Hz	peak	3.000	3.064	-0.064	1.9
4	100 Hz		4.000	4.072	-0.072	1.9
5	100 Hz		5.000	5.085	-0.085	1.9
6	100 Hz		6.000	6.091	-0.091	1.9
7	100 Hz		7.000	7.099	-0.099	1.9

Certificate No. Q23117019
F3-011-04/01-12

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	\pm (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.7
0.04	50 Hz		0.040	0.040	0.000	2.4
0.05	50 Hz		0.050	0.050	0.000	2.2
0.06	50 Hz		0.060	0.061	-0.001	2.1
0.07	50 Hz		0.070	0.071	-0.001	2.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.7
0.04	100 Hz		0.040	0.040	0.000	2.4
0.05	100 Hz		0.050	0.050	0.000	2.2
0.06	100 Hz		0.060	0.061	-0.001	2.1
0.07	100 Hz		0.070	0.071	-0.001	2.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 009 Page 1,2 of 59

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23117019
F3-011-04/01-12

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เอกสารไม่ควบคุม

qcalibration

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAE.EFM.171/2564

Class : 1
Range : 94 , 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	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

Mr. Paet Muthavorn
Calibration Engineer Supervisor

Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue Date 5/6/24

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Certificate No : 24-ACT-091

Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

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	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	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
114 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	0.24	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	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.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue Date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Decision Rule for Statements of Conformity

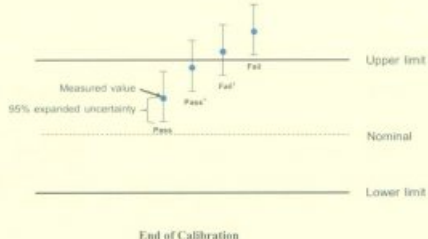
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019 Guidelines on the Reporting of Compliance with Specification as following Fig. and statement:

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

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

Fail^h - 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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue Date 5/6/24

เอกสารไม่ควบคุม



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240289EA
Operation No.: CP2024070252

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)

ID No.: UAE.EFM.042/2566

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260

Received Date: 25 July 2024

Calibrated Date: 5 - 6 August 2024

Issued Date: 7 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

เอกสารไม่ควบคุม

Certificate No.: CP20240289EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)
ID No.: UAE EFM.042/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2)	Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3)	Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4)	6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5)	Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6)	Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240289EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8
141.0	141.0	0.0	±0.8

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F-CAL-005 Ed.1

Certificate No.: CP20240289EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
30.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	30.1
C-weighting	30.0
Z-weighting	35.7

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.2	0.3	±1.0
1000	0.2	0.2	0.2	±0.7
8000	-0.2	-0.1	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1

Certificate No.: CP20240289EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240289EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
144.3	144.2	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 1.
 4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240288EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007312 (Meter), 345818 (Microphone), 077647 (Preamplifier)
ID No.: UAE.EFM.044/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240288EA

Operation No.: CP2024070251

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007312 (Meter), 345818 (Microphone), 077647 (Preamplifier)
ID No.: UAE.EFM.044/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

(Mr. Sittichai Swaksuriyawong)

Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)

providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except

with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240288EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.4
C-weighting	28.3
Z-weighting	34.1

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.9	-0.9	-0.8	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	-0.1	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1

Certificate No.: CP20240288EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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Certificate No.: CP20240288EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.3	0.3	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
LAE	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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Certificate No.: CP20240288EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.4	142.3	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10kHz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25
5	Hot Air Oven	SUSPENDED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1 Apr 24	31 Mar 25
6	Cooled Incubator	TOTAL COLIFORM BACTERIA	Binder	KB400 / WTB20200000015535	Technology Promotion Association (Thailand-Japan)	24TM647	1 Apr 24	31 Mar 25
7	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25
8	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25
9	pH Meter	pH	YSI Environmental	pH 100A / JC03354	Technology Promotion Association (Thailand-Japan)	23CH1487	22 Nov 23	21 Nov 24

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khiti Ruttanaprapachai
Approved by :
() Ponpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used : Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Cert.No.: 24MM292
Page: 2 of 3

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15864	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certificate is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

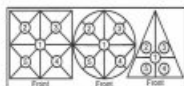
1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading (g)
0.0001

2. Effect of off center loading
A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร
ศูนย์บริการทดสอบวิชาการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-C5-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210683394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 100g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NF187H 036/23	Quality Reborn	Q624-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certification was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

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Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 2 of 4**

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	MC394535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate is certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

F-CS-012 Revision: 01 Date: 20-04-65



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Date of Calibration: 2 April 2024 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000008	2.00
0.001	0.001003	0.001001	-0.000001	0.0000091	2.00
0.005	0.005003	0.004999	-0.000004	0.0000094	2.00
0.01	0.010003	0.010000	-0.000003	0.0000091	2.00
0.05	0.049996	0.050000	0.000004	0.0000098	2.00
0.1	0.100011	0.100000	-0.000011	0.000011	2.00
0.5	0.500018	0.500001	-0.000017	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000002	-0.000015	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000031	20.000002	-0.000029	0.000037	2.00
30	30.000040	30.000003	-0.000037	0.000052	2.00
50	50.000078	50.000004	-0.000074	0.000068	2.00
80	80.000068	80.000005	-0.000063	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

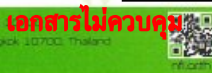
3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
90	90.000010	90.000002	-0.000008	0.000015	2.00
100	100.000006	100.000000	-0.000006	0.000015	2.00
110	110.000007	110.000001	-0.000006	0.000017	2.00
120	120.000009	120.000000	-0.000009	0.000018	2.00
130	130.000010	130.000000	-0.000010	0.000019	2.00
140	140.000014	140.000000	-0.000014	0.000020	2.00
150	150.000009	150.000001	-0.000008	0.000020	2.00
160	160.000010	160.000001	-0.000009	0.000022	2.00
170	170.000012	170.000001	-0.000011	0.000023	2.00
200	200.000016	200.000003	-0.000013	0.000028	2.00

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 %.

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3900 FAX. 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
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 : Walailak Sirthean
Approved by : [Signature]
() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai
Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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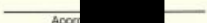


TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Mammert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee
Approved by : 
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat
Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม
A 0055055



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Cert. No.: 24TM589
Page : 2 of 3

Procedure Used :-

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) 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)

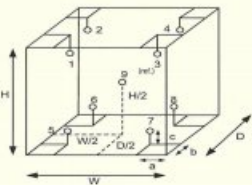
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.50 m
b = 5.0 cm W = 0.80 m
c = 5.0 cm H = 0.75 m
Capacity = 0.30 m³

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Cert. No.: 24TM589
Page : 3 of 3

Result of Calibration :-

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.106	103.891	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.870	179.594	179.790	180.287	179.961	179.802	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 %.

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เอกสารไม่ควบคุม
a 1209739



Certificate of Calibration

Cert. No.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : $(20 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Man Pattanapongsaiboon
Approved by :
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 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.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Procedure Used :-

Cert. No.: 24TM647
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	MY49023932	23LM122	TPA	26 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.

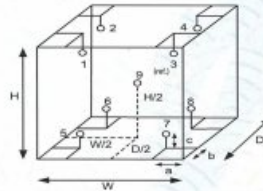
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
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
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	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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เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 9 Feb 2024
Customer: UAE
Instrument: K7200

FOSS South East Asia
3388 Srinnet Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110

Report No: 9810

Address: Bangkok

Serial: 91790524

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:30	08:00	16:30
Finish	09:30	20:00	18:00

Application		Special		Standard	
Normal	x	Courtesy Visit	x	Installation	x
Distributor	x	PMA Onboarding	x	Quote	x
Internal	x	Warranty	x	Repair	x
Digital Service	x	Sales Support	x	Remote	x
				PM	x
				Other	x

PO/Quote Number: If applicable

PMA Type: FOSSENT If applicable Contract No. If applicable

Details of Work / Test		Condition / Status
# PMA K7200		
- ตรวจสอบการทำงานของ PMA		
- ตรวจสอบค่าอุณหภูมิ 3 จุด 100 mL		
- ค่าเฉลี่ย 30 mL - 80 mL		
- ตรวจสอบ PMA kit		
- ตรวจสอบการใช้งาน		
# ตรวจสอบ SOPH Head ตรวจสอบค่าอุณหภูมิ 3 จุด 100 mL		
10000725 SOPH head complete 1 PC		
Instrument Ready for Use		OK / Not OK If not OK - Comment

Part No:	Batch	Description	Qty
10099965	14.12.2020	Foss PMA kit lot 100 lot 101 lot 102 lot 103	1

Would you be willing to participate in a brief survey in order to tell us how we performed?

(Email)

เอกสารไม่ควบคุม

Date: 8-9 Feb 2024
Customer: VAE
Instrument: KTS100

FOSS South East Asia
3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110
Report No: 9807
Address: BANGKOK
Serial: 91889052

Hours
Start 08:00
Finish 09:30
Travel To Customer 1.5 hr
Labour 09:50
18:00 2.5 hr
Travel From Customer 1.5 hr
2 hr

Application		Special		Job Type		Standard	
Normal	x	Courtesy Visit	x	Installation	x	Training	x
Distributor	x	PMA Onboarding	x	Quote	x	In House	x
Internal	x	Warranty	x	Repair	x	Pst	x
Digital Service	x	Sales Support	x	Remote	x	Other	x

PO/Quote Number: If applicable

PMA Type: PMS-2024 If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
<p>PM KTS100</p> <ul style="list-style-type: none">- ตรวจเช็คการทำงานของ PM- ตรวจ Alkaline 50 - 50 ml- ตรวจ range 0 - 100 ml- ตรวจ range PM test- follow range PM protocol- ตรวจ range PM test <p>Display = 0.14</p> <p>Pressure = 10.5 psi</p>	OK
Instrument Ready for Use	

Instrument Ready for Use ☒ OK ☐ Not OK If not OK - Comment

Part No.	Batch	Description	Qty
60031807	13-10-2023	PMS kit 500/500 12-00	1

I confirm this report is accurate and complete

Would you be willing to participate in a brief survey in order to tell us how we performed? Email

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK, 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH1487
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC03354
ID No. : UAE.EFM.063/2562(ENV.pH 03/62)
Condition As-Received: Used Item
Received Date : 21 November 2023
Calibration Date : 22 November 2023
Reference : 2311-0720WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH6 by comparison with standard thermometer

Calibrated by : Warakorn Lerngatrakul

Approved by :
(✓) Saitip Meangmai
() Warakorn Lerngatrakul
() Ponpan Palpim

Issue Date : 27 November 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0061266



Cert.No.: 23CH1487
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	913598	14 July 2025
pH 6.985	CPA chem	913599	14 July 2024
pH 9.997	CPA chem	940105	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)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: JC03354	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.01	0.58	2.00



Cert.No.: 23CH1487
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

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: 230906SIA605377	4.008	4.01	174	0.0085	2.05
	6.985	7.00	-2	0.0099	2.00
	6.985	7.00	-2	0.0093	2.00
	9.997	10.00	-177	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 230906SIA605377
Dimension of probe:
- Length : 110 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	25.002	25.1	0.098	0.13	2.00
30.0	30.001	30.1	0.099	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารสอบเทียบเครื่องมือ

ประจำเดือนกันยายน พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3541	Jiranatee Associates Co., Ltd.	CL-012-65	31 Oct 22	30 Oct 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 163268	Innovative Instrument Co., Ltd.	23-AFM-211	4 Oct 23	3 Oct 24	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H756	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM22387039	UAE Consultant Co., Ltd.	07112023	7 Nov 23	6 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM22387040	UAE Consultant Co., Ltd.	07112023	7 Nov 23	6 Nov 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387065	UAE Consultant Co., Ltd.	03112023	3 Nov 23	2 Nov 24	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387066	UAE Consultant Co., Ltd.	03112023	3 Nov 23	2 Nov 24	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Horiba	APMA-370 YRLHTB7G	UAE Consultant Co., Ltd.	08122023	8 Dec 23	7 Dec 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-65506-348	UAE Consultant Co.,Ltd.	08122023	8 Dec 23	7 Dec 24	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 T4FG19AN	UAE Consultant Co.,Ltd.	21122023	21 Dec 23	20 Dec 24	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 HAMEHU5M	UAE Consultant Co.,Ltd.	15122023	15 Dec 23	14 Dec 24	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14470	Calibration Laboratory Co.Ltd	Q23102594	15 Sep 23	14 Sep 24	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV36 107224	Innovative Instrument Co.,Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
20	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007310	Electrical And Electronics Institute Foundation For Industrial Development	CP20240289EA	5 Aug 24	4 Aug 25	-
21	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007312	Electrical And Electronics Institute Foundation For Industrial Development	CP20240288EA	5 Aug 24	4 Aug 25	-

CERTIFICATE OF CALIBRATION

Certificate No. : CL-012-65

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TSCN
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3541
ID NUMBER : UAE.EFM.177/2561
CONDITION AS-RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

Calibration procedure:
The Orifice gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G65/MC/W2-00. The W-2-004
was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the
measurement to recognize the national
standards and to recognition of the international
system of units (SI) through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: 02211901

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)

RECEIVED DATE : 25 Oct 2022
MEASUREMENT DATE : 31 Oct 2022
ISSUE DATE : 02 Nov 2022

ENVIRONMENTAL CONDITIONS:

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

CAUTION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.7 °C and 62.2 %RH.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
S. Mr. Sompote Thacholai
M. Mr. Jiraporn Lertsomphol



Approved signatory:

Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS GRANTED IN WRITING FROM THE LABORATORY

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Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Qs] m^3/min
1	0.700	756.152	24.690	24.150	56.497	1.688	1.296	0.647
2	1.001	756.144	24.650	24.100	60.829	3.430	1.843	0.919
3	1.119	756.100	24.670	24.080	41.077	4.527	2.123	1.056
4	1.169	756.072	24.580	24.130	30.350	5.100	2.214	1.119
5	1.417	756.087	24.300	23.850	29.843	7.540	2.742	1.359

Slope (m): 2.02990
Intercept (b): -0.01831
Correlation coefficient (r): 0.99973
Uncertainty (k=2): 0.012 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Qs] m^3/min
1	0.700	756.152	24.690	24.150	56.497	1.688	0.815	0.649
2	1.001	756.144	24.650	24.100	60.829	3.430	1.139	0.922
3	1.119	756.100	24.670	24.080	41.077	4.527	1.335	1.060
4	1.169	756.072	24.580	24.130	30.350	5.100	1.417	1.123
5	1.417	756.087	24.300	23.850	29.843	7.540	1.722	1.363

Slope (m): 1.27542
Intercept (b): -0.01152
Correlation coefficient (r): 0.99973
Uncertainty (k=2): 0.013 m^3/min

End of Certificate of Calibration



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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. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1250
Page: 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.078/2566

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 10 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using "DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

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

- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Prathapal
[] Sura Suwannasri
[✓] Attapol Panurach

เอกสารไม่ควบคุม



Cert.No.: 24P1250
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range : 0 inH₂O to 36 inH₂O
Scale Interval : 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.05	-4.95	10.00	0.00
12.00	6.05	-5.95	12.00	0.00
14.00	7.05	-6.95	14.00	0.00
16.00	8.10	-7.95	16.05	0.05
18.00	9.10	-8.95	18.05	0.05
20.00	10.10	-9.95	20.05	0.05
22.00	11.10	-10.95	22.05	0.05
24.00	12.10	-11.95	24.05	0.05
26.00	13.15	-12.95	26.10	0.10
28.00	14.15	-13.95	28.10	0.10
30.00	15.20	-14.95	30.15	0.15
32.00	16.20	-15.95	32.15	0.15
34.00	17.20	-16.95	34.15	0.15
35.50	18.00	-17.70	35.70	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name :
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-AFM-211
Request No : Req-2023-2070

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
ID : UAE.EFM.174/2561
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 : 29 September 2023
Calibration Date : 4 October 2023
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 Standard flow	19031011003	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qredera	27 February 2024
Pressure meter	CPG2400	41000KDU/631882	TPA	7 November 2023


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. Noppadol Luangart
Service Calibration Engineer

Approved By : 
Mr. Paen Mallavorn
Calibration Engineer Supervisor
Issue Date : 4 October 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/23

Certificate No : 23-AFM-211
Request No : Req-2023-2070

Result of Calibration :

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)
23.90	100.76	14.40	14.50	0.10	0.20
23.90	100.75	14.91	15.00	0.09	0.21
24.80	100.90	15.72	15.80	0.08	0.22
23.80	100.77	16.58	16.67	0.09	0.23
23.70	100.78	18.23	18.30	0.07	0.26

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 25.0 °C, 101.3 kPa, Air
- 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 not accredited

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 lab. **เอกสารไม่ควบคุม**
FM-708-AFM-01 Rev.00 Issue date 01/07/23

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name :
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 23-TPM-475
Request No : Req-2023-2070

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
Resolution : 0.1 °C
ID Number : UAE.EFM.174/2561
Range Calibration : 20 °C to 50 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 29 September 2023
Calibrated Date : 4 October 2023
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 27 February 2023, Calibration Certificate No. : QR23-0494

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Noppadol Luangart
Technical Manager
Issue Date : 5 October 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-TPM-01 Rev.01 Issue date 13/02/23

Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 23-TPM-475
Request No : Req-2023-2070
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
Ta	20.035	19.9	+ 0.1	0.13
	25.034	24.9	+ 0.1	0.13
	30.033	30.1	- 0.1	0.13
	35.035	35.2	- 0.2	0.13
	40.041	40.2	- 0.2	0.13
	45.042	45.2	- 0.2	0.13
Tt	20.035	19.9	+ 0.1	0.13
	25.034	24.9	+ 0.1	0.13
	30.033	30.1	- 0.1	0.13
	35.035	35.1	- 0.1	0.13
	40.041	40.1	- 0.1	0.13
	45.042	45.1	- 0.1	0.13

End of Certificate

Calibrated By : 
Mr. Noppadol Luangart

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the lab. **เอกสารไม่ควบคุม**
FM-708-TPM-01 Rev.01 Issue date 13/02/23



Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4.This result of calibration instrument was in absolute pressure.

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] Attapol Panurach

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Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range : 960 hPa to 1030 hPa

Scale Interval : 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 24H756
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.131/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

2.The 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 maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :
[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

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Result of Calibration:-

Function: Humidity Measurement.

Without Adjustment

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:-

Function: Temperature Measurement.

Without Adjustment

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.0	-0.032	0.72
29.997	30.0	0.003	0.72
35.010	34.5	-0.510	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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MULTI-POINT GAS TEST REPORT

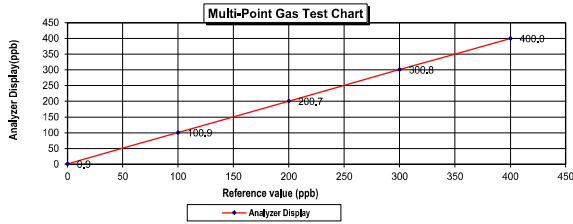
Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM22387039

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,9	0,90	0,90	0,90
Level 2	20,00%	100,0	100,9	0,90	0,89	0,89
Level 3	40,00%	200,0	200,7	0,70	0,35	0,35
Level 4	60,00%	300,0	300,8	0,80	0,27	0,27
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb	Average Difference (%)		0,48	



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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

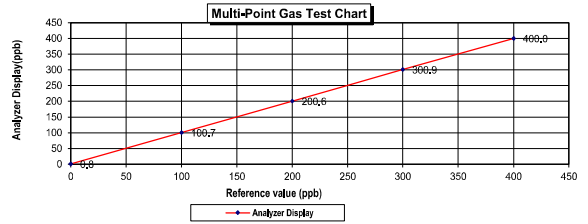
Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM22387040

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,8	0,80	0,80	0,80
Level 2	20,00%	100,0	100,7	0,70	0,70	0,70
Level 3	40,00%	200,0	200,6	0,60	0,30	0,30
Level 4	60,00%	300,0	300,9	0,90	0,30	0,30
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb		Average Difference (%)		0,42



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Airgas Specialty Gases
Airgas USA LLC
6141 Station Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014 Reference Number: 160-402772205-1
Cylinder Number: EB0162121 Cylinder Volume: 144.0 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2016 PSIG
PGVP Number: A12023 Valve Outlet: 560
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APE1814048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMIS	16340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.5%	Sep 29, 2025
NTRM	160102-22	KAL000820	97.59 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025

The NTRM, NTRM, PRM, or ROW noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iSSO FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iSSO FTIR AUP2010245 NO ₂	FTIR	Jun 29, 2023
Nicolet iSSO FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iSSO FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023



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เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

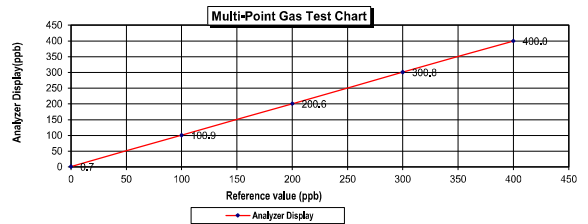
Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387065

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.6	0.60	0.30	0.30
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.43



07 / NOV / 2023 08 / NOV / 2023

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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

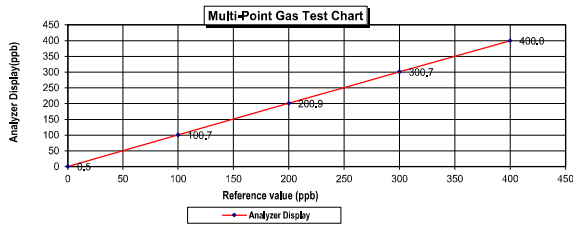
Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387066

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,5	0,50	0,50	0,50
Level 2	20,00%	100,0	100,7	0,70	0,70	0,70
Level 3	40,00%	200,0	200,9	0,90	0,45	0,45
Level 4	60,00%	300,0	300,7	0,70	0,23	0,23
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb	Average Difference (%)			0,38



เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 560

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards (May 2012)" document EPA 600/R-12/051, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104022308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APE1614048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMIS	15340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.59 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.9%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 PPM CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025

The SWM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

Approved for Release

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MULTI-POINT GAS TEST REPORT

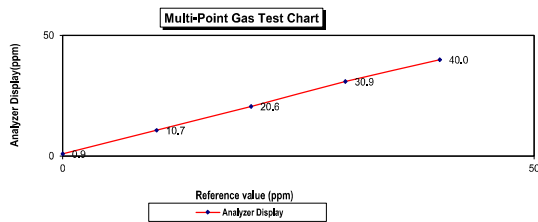
Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-69160-362

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,9	0,9	0,9	0,9
Level 2	20,00%	10,0	10,7	0,7	6,5	6,5
Level 3	40,00%	20,0	20,6	0,6	2,9	2,9
Level 4	60,00%	30,0	30,9	0,9	2,9	2,9
Level 5	80,00%	40,0	40,0	0,0	0,0	0,0
Remark : Measuring Range			50,0 ppm	Average Difference (%)		2,65



8 / 11 / 2023

8 / Nov / 2023

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MULTI-POINT GAS TEST REPORT

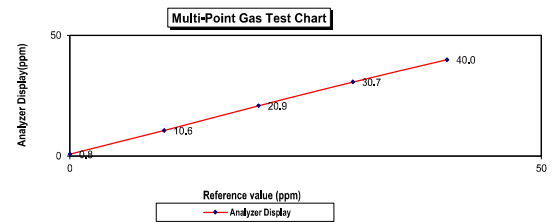
Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-65506-348

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,8	0,8	0,8	0,8
Level 2	20,00%	10,0	10,6	0,6	5,7	5,7
Level 3	40,00%	20,0	20,9	0,9	4,3	4,3
Level 4	60,00%	30,0	30,7	0,7	2,3	2,3
Level 5	80,00%	40,0	40,0	0,0	0,0	0,0
Remark : Measuring Range		50,0 ppm	Average Difference (%)			2,61



8 / 12 / 2023

8 / Dec / 2023

เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,CO2,NO,NOX,SO2,BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with EPA Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	16340202002	E90100037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The SRM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicolet 550 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023	
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023	
Nicolet 550 FTIR AUP2010245 NO	FTIR	Jun 29, 2023	
Nicolet 550 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023	
Nicolet 550 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023	

Approved for Release

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MULTI-POINT GAS TEST REPORT

Test Date : Dec 21, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : T4FG19AN

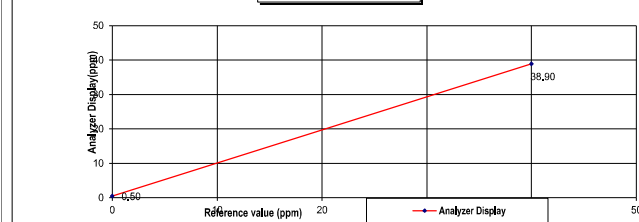
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH ₄)	39.8 PPM	Serial Number :	
Carbon Monoxide (CO)	- PPM		
Cylinder No. :	D824432		
Expiration Date :	Aug 4, 2028		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	0.50	0.50	0.50
Level 2	80.00%	40.00	36.90	-2.83	2.83
Remark :	Measuring Range	50.00 ppm	Average Difference (%)	1.66	

:Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



..21.....12.....2023..

..22.....Dec.....2023..

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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 15, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : HAMEHUSM

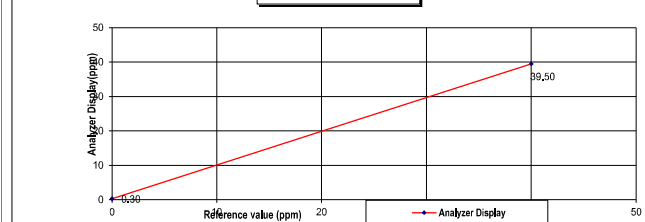
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH ₄)	39.8 PPM	Serial Number :	
Carbon Monoxide (CO)	- PPM		
Cylinder No. :	D824432		
Expiration Date :	Aug 4, 2028		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	0.30	0.30	0.30
Level 2	80.00%	40.00	39.50	-1.27	1.27
Remark :	Measuring Range	50.00 ppm	Average Difference (%)	0.78	

:Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



Calculate by

Average by

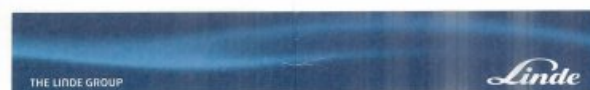
..15.....12.....2023..

..16.....Dec.....2023..

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Certificate Of Analysis

Special Gases Mixture

Customer Details		Address:		Customer Tag No.:	
Name:	United Analyst & Engineering Co., Ltd.	3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khet Phra Khanong, Bangkok 10260			
Certificate Details					
Number:	3184/20	Date of Issue:	4-Aug-2020	Expiry date:	4-Aug-2028
Material Details					
Production Order:	90161442	Material Code:	400400-AI-34	Cylinder No.:	D824432
Gas content:	6.60 M ³	Filling pressure:	137.0 bar	Valves:	C5A 590 BRASS
Laboratory Owner:	UNICE	Cylinder Material:	Aluminum	Cylinder Size:	50L

Laboratory Report		Analytical Result		Method of Analysis ²	Assay Date
Component	Normalised Concentration	Analysis Result ¹	Uncertainty ²		
Methane in Air	40.0 ppm	39.5 ppm	\pm 1% relative	(6)-FID-512	4-Aug-2020

Reference Standard		Reference Standard used in Assay		Expiry date:
		Cylinder number	Concentration	
		25319956	47.25 \pm 0.39 ppm	3-Oct-2023

Instrument/Make/Model		Analytical Instruments used in Assay		Last Multipoint Calibration
		Analytical Principle		
	FTIR Spectrometers Nicolet 550	FTIR-CH4		4-Aug-2020

Recommend usage condition

Minimum utilisation : 5% of actual content or before expiry date whichever comes first.

Storage condition : keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

- All results expressed in this report are on molar/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Testability Protocol (EPA-600/R-12/031) for the Assay and Certification of Gaseous Calibration Standards using gravimetry.
- The reported impurity level is based on a standard uncertainty multiplied by a coverage factor of 2, providing a level of confidence of approximately 95%. The impurity level of this material is traceable to the SI through the reference gas standard which is traceable to two National Standard of Mass or other recognized calibration and/or analysis.
- (1) Gas Chromatography, (2) Photometric Oxygen Analyser, (3) Electrochemical Oxygen Analyser, (4) Electrochemical Methane Analyser, (5) Total Hydrocarbon Analyser, (6) Other - Specified

Sukanya Parinyasorn202310

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

PB 002/1006

Linde (Thailand) Public Company Limited/ลิ้นดี (ประเทศไทย) จำกัด

157 Flax, Bangkok Branch 4, 1/15 Flax 14, Bangkok Suburb 4, 3 Road, Bangkok

Bangkok, Suburban 10111, Tel. (662) 238-0101 Fax (662) 238-0103

Bangkok Head Office 1, 1 Suburban, Suburban 10111, Tel. (662) 238-0101 Fax (662) 238-0103

Bangkok 10111, Tel. (662) 238-0101 Fax (662) 238-0103



CALIBRATION LABORATORY Co.,LTD.

210-11.14.55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION LABORATORY Co.,LTD.

210-11.14.55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14470/UM14470
CLID. NO. : 252000713
JOB CONTROL NO. : 230914102594

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 14 September 2023

DATE OF ISSUED : 19 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
19 September 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23102594
F3-011-04/01-12

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14470/UM14470
DATE OF CALIBRATION : 15 September 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
- Accelerometer with Conditioning Amplifier, Bruel & Kjaer Model 8305, 2626 S/N. 705491, 1741-006.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 03 April 2024.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. EE-00010-23, Due Date 27 March 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0025-22, Due Date 12 October 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23102594
F3-011-04/01-12

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co.,LTD.

210-11.14.55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	\pm (% of rdg.)
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.9
0.5	50 Hz		0.500	0.503	-0.003	1.3
0.6	50 Hz		0.600	0.604	-0.004	1.3
0.7	50 Hz		0.700	0.706	-0.006	1.3
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.505	-0.005	1.3
0.6	100 Hz		0.600	0.607	-0.007	1.3
0.7	100 Hz		0.700	0.710	-0.010	1.3

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
3	50 Hz	peak	3.000	3.043	-0.043	1.8
4	50 Hz		4.000	4.055	-0.055	1.8
5	50 Hz		5.000	5.068	-0.068	1.8
6	50 Hz		6.000	6.075	-0.075	1.8
7	50 Hz		7.000	7.093	-0.093	1.8
3	100 Hz	peak	3.000	3.041	-0.041	1.8
4	100 Hz		4.000	4.048	-0.048	1.8
5	100 Hz		5.000	5.079	-0.079	1.8
6	100 Hz		6.000	6.091	-0.091	1.8
7	100 Hz		7.000	7.123	-0.123	1.8

Certificate No. Q23102594
F3-011-04/01-12

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	\pm (% of rdg.)
*0.03	50 Hz	peak	0.030	0.030	0.000	2.1
*0.04	50 Hz		0.040	0.040	0.000	1.7
*0.05	50 Hz		0.050	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.060	0.000	1.3
*0.07	50 Hz		0.070	0.071	-0.001	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: * means Calibrations marked * Not ANAB Accredited * In this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q23102594
F3-011-04/01-12

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Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAE.EFM.171/2564

Class : 1
Range : 94 , 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	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

Mr. Paet Muthavorn
Calibration Engineer Supervisor

Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

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Certificate No : 24-ACT-091

Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

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	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	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
114 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	0.24	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	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.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Decision Rule for Statements of Conformity

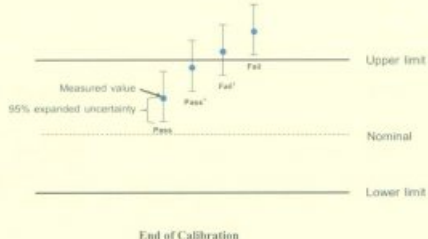
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019 Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

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

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

Fail^h - 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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม่ควบคุม



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240289EA
Operation No.: CP2024070252

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)
ID No.: UAE.EFM.042/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

เอกสารไม่ควบคุม

Certificate No.: CP20240289EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)
ID No.: UAE EFM.042/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2)	Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3)	Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4)	6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5)	Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6)	Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

เอกสารไม่ควบคุม

Certificate No.: CP20240289EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
30.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	30.1
C-weighting	30.0
Z-weighting	35.7

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.2	0.3	±1.0
1000	0.2	0.2	0.2	±0.7
8000	-0.2	-0.1	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240289EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8
141.0	141.0	0.0	±0.8

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Certificate No.: CP20240289EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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Certificate No.: CP20240289EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
144.3	144.2	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 1.
 4. The coverage factor $k = 2.00$

-- End of Report --

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Certificate No.: CP20240288EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007312 (Meter), 345818 (Microphone), 077647 (Preamplifier)
ID No.: UAE.EFM.044/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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- National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Certificate No.: CP20240288EA

Operation No.: CP2024070251

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007312 (Meter), 345818 (Microphone), 077647 (Preamplifier)
ID No.: UAE.EFM.044/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

(Mr. Sittichai Swaksuriyawong)

Group Manager

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Certificate No.: CP20240288EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.4
C-weighting	28.3
Z-weighting	34.1

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.9	-0.9	-0.8	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	-0.1	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240288EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240288EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.3	0.3	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
LAE	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240288EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.4	142.3	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10kHz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1 Apr 24	31 Mar 25
6	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25
7	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25
8	pH Meter	pH	Horiba	LAQUA-PH210 / HA0E0041	technology promotion association (thailand-japan	24CH725	19 Jun 24	17 Jun 25

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khitt Ruttanaprapachai
Approved by :
() Ponpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used : Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Cert.No.: 24MM292
Page: 2 of 3

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15864	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

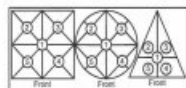
Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading (g)
0.0001

2. Effect of off center loading
A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร
ศูนย์บริการทดสอบวิชาการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 100g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606-H1	NF187H 036/23	Quality Reborn	Q624-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This result was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

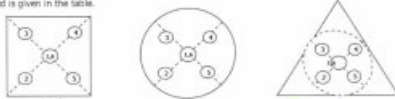
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

F-CS-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000086	2.00
0.001	0.001002	0.001011	-0.000011	0.0000089	2.00
0.005	0.005002	0.005000	0.000002	0.0000092	2.00
0.01	0.010003	0.010000	0.000003	0.0000089	2.00
0.05	0.049996	0.050000	0.000004	0.0000096	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000016	2.00
2	2.000023	2.000001	0.000022	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000009	10.000000	0.000009	0.000026	2.00
20	20.000031	20.000000	0.000031	0.000037	2.00
30	30.000040	30.000001	0.000039	0.000050	2.00
50	50.000028	50.000002	0.000026	0.000066	2.00
80	80.000068	80.000002	0.000066	0.000111	2.00

F-CS-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	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 %.

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 2 of 4**

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	MC394535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000008	2.00
0.001	0.001003	0.001001	-0.000001	0.0000091	2.00
0.005	0.005003	0.005000	-0.000001	0.0000094	2.00
0.01	0.010003	0.010000	-0.000001	0.0000091	2.00
0.05	0.049996	0.050000	0.000000	0.0000098	2.00
0.1	0.100011	0.100000	-0.000001	0.000011	2.00
0.5	0.500018	0.500001	-0.000001	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	-0.000001	0.000017	2.00
5	5.000017	5.000002	-0.000001	0.000020	2.00
10	10.000009	10.000000	-0.000001	0.000026	2.00
20	20.000031	20.000002	-0.000001	0.000037	2.00
30	30.000040	30.000003	-0.000001	0.000052	2.00
50	50.000078	50.000004	-0.000001	0.000068	2.00
80	80.000068	80.000005	-0.000001	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
90	90.000010	90.000002	-0.000001	0.000015	2.00
100	100.000006	100.000000	-0.000001	0.000015	2.00
110	110.000007	110.000001	-0.000001	0.000017	2.00
120	120.000009	120.000000	-0.000001	0.000018	2.00
130	130.000010	130.000000	-0.000001	0.000019	2.00
140	140.000014	140.000000	-0.000001	0.000020	2.00
150	150.000009	150.000001	-0.000001	0.000020	2.00
160	160.000010	160.000001	-0.000001	0.000022	2.00
170	170.000012	170.000001	-0.000001	0.000023	2.00
200	200.000016	200.000003	-0.000001	0.000028	2.00

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL: 0-2717-3800 FAX: 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

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 Sirthean
Approved by : [Signature]
Approved signatory

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

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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เอกสารไม่

FOSS

Customer Service Report

Date: 9 Feb 2024
Customer: UAE
Instrument: KT200

FOSS South East Asia
3388 Srinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No: 9810

Address: Bangkok

Serial: 91790524

Hours
Start 08:00
Finish 09:30

Labour
09:00
12:00

Travel From Customer
14:30
16:30

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: - If applicable

PMA Type FOSSCATC If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM KT200 - ตรวจเช็คแบตเตอรี่ PM - ตรวจสอบระดับน้ำ 3 min 100 ml - Balance 50 ml - 30 ml - วัดค่า DO PM kit - ตรวจสอบระดับน้ำ PM	done
# ตรวจเช็ค SRPH Model 4100SRV ที่ห้องควบคุม 10000329 SRPH Model Complete 1 PC	

Instrument Ready for Use ☒ OK ☐ Not OK If not OK - Comment

Part No.	Batch	Description	Qty
10000329	14.12.2020	Foss PM kit kit 500 levelist Analyser 8100	1

Would you be willing to participate in a brief survey in order to tell us how we performed?

Email

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FOSS

Customer Service Report

Date: 8 Feb 2024
Customer: UAE
Instrument: KT100

FOSS South East Asia
3388 Srinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No: 9807

Address: Bangkok

Serial: 91889052

Hours
Start 08:00
Finish 09:30

Labour
09:00
12:00

Travel From Customer
16:00
18:00

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: - If applicable

PMA Type FOSSCATC If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM KT100 - ตรวจเช็คแบตเตอรี่ PM - ตรวจสอบระดับน้ำ 50 - 50 ml - ตรวจสอบระดับน้ำ 5 min - 180 ml - วัดค่า DO PM kit - ตรวจสอบระดับน้ำ PM - ตรวจสอบระดับน้ำ PM	done
Balance - 0.1g Precision - 100 %	

Instrument Ready for Use ☒ OK ☐ Not OK If not OK - Comment

Part No.	Batch	Description	Qty
6003107	13.10.2023	Foss PM kit 8100/8100 12 ml	1

Would you be willing to participate in a brief survey in order to tell us how we performed?

Email

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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.: 24CH725
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HAOE0041
ID No. : UAE.EFM.069/2564 (EFM.pH.02/64)
Condition As-Received: Used Item
Received Date : 18 June 2024
Calibration Date : 19 June 2024
Reference : 2406-0570WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
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)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lerngatrakul

Approved by :

Approved signature

() Unnophol Harachai
() Ponpan Palpim
(✓) Sathip Meangmai

Issue Date : 20 June 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 24CH725
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	23/908	26 July 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)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: HA0E0041	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	10.00	-177.48	-177.2	10.01	0.058	2.00



Cert.No.: 24CH725
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor <i>k</i>
pH Electrode S/N.: Q9AA0001	4.008	4.01	177.6	0.0085	2.05
	6.986	7.00	2.5	0.012	2.05
	6.986	7.00	3.1	0.011	2.00
	9.997	10.01	-170.8	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9852-10D
- Serial No. : Q9AA0001

Dimension of probe

- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor <i>k</i>
25.0	25.004	25.0	-0.004	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.002	35.0	-0.002	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารสอบเทียบเครื่องมือ

ประจำเดือนตุลาคม พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 11MX	Jiranatee Associates Co., Ltd.	CO-005-66	12 Jun 23	11 Jun 25	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	10 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 158850	Innovative Instrument Co.,Ltd.	24-AFM-173	28 Aug 24	27 Aug 25	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H756	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050149	UAE Consultant Co.,Ltd.	01112023	1 Nov 23	31 Oct 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050150	UAE Consultant Co.,Ltd.	01112023	1 Nov 23	31 Oct 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N191E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1200906875	UAE Consultant Co.,Ltd.	03112023	3 Nov 23	2 Nov 24	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1200906876	UAE Consultant Co.,Ltd.	09112023	9 Nov 23	8 Nov 24	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N191E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-62494-335-5	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-69160-362	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 T4FG19AN	UAE Consultant Co.,Ltd.	21122023	21 Dec 23	20 Dec 24	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 HAMEHU5M	UAE Consultant Co.,Ltd.	15122023	15 Dec 23	14 Dec 24	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11058	Calibration Laboratory Co.Ltd	Q24037354	8 Apr 24	7 Apr 25	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV36 107224	Innovative Instrument Co.,Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
20	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007306	Electrical And Electronics Institute Foundation For Industrial Development	CP20240290EA	5 Aug 24	4 Aug 25	-
21	Sound Level Meter	$L_{Aeq\ 1\ hr}$ $L_{Aeq\ 24\ hrs}$ L_{Amax} L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007308	Electrical And Electronics Institute Foundation For Industrial Development	CP20240322EA	22 Aug 24	21 Aug 25	-

CERTIFICATE OF CALIBRATION

Certificate No. : CO-005-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : Andersen Instruments
MODEL/TYPE : G25A
SERIAL NUMBER : 11MX
ID NUMBER : UAE.ANV.008/2543
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 02 Jun 2023
MEASUREMENT DATE : 12 Jun 2023
ISSUE DATE : 12 Jun 2023

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.0 °C and 56.4 %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 Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model 065/MC/M2-Sp. The We-GI-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: 6221591.

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".

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q standard calibration data

Plate	Flow rate m^3/min	Pressure (Pa) mmHg	Temperature (Ta) °C	Temperature (Tm) °C	Δp_{meter} mmHg	$\Delta p_{\text{Orifice}}$ inH ₂ O	γ	Standard Flow (Q_s) m^3/min
1	0.705	754.535	24.09	23.49	51.470	1.745	1.318	0.656
2	0.998	754.592	24.01	23.68	55.777	3.453	1.855	0.922
3	1.124	754.473	23.93	23.53	37.502	4.619	2.345	1.066
4	1.172	754.436	23.39	23.00	27.960	5.187	2.275	1.128
5	1.418	754.502	23.52	23.02	28.014	7.616	2.756	1.365

Slope (m): 2.02897
Intercept (b): -0.01391
Correlation coefficient (r): 0.99986
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure (Pa) mmHg	Temperature (Ta) °C	Temperature (Tm) °C	Δp_{meter} mmHg	$\Delta p_{\text{Orifice}}$ inH ₂ O	γ	Standard Flow (Q_s) m^3/min
1	0.705	754.535	24.09	23.49	51.470	1.745	0.819	0.658
2	0.998	754.592	24.01	23.68	55.777	3.453	1.166	0.925
3	1.124	754.473	23.93	23.53	37.502	4.619	1.349	1.070
4	1.172	754.436	23.39	23.00	27.960	5.187	1.428	1.130
5	1.418	754.502	23.52	23.02	28.014	7.616	1.730	1.368

Slope (m): 1.27084
Intercept (b): -0.00875
Correlation coefficient (r): 0.99986
Uncertainty (k=2): 0.015 m^3/min

End of Certificate of Calibration

Calibrated by:
☒ Mr. Sorawit Thachulad
☐ Mr. Atsapon Lamsomphol

Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager



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



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

Certificate of Calibration

Certificate No.: 24P1252
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.078/2566

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1011 mbar

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using "DKD-R 6-1; Calibration of Pressure Gauges" as a guidelines.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No, Calibration 0144

Calibrated by: Suksan Khankaew
Issue Date: 17 April 2024

Approved Signatory :
[] Phalinee Prathpalpal
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1252
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	Δp	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.05	14.05	0.05
16.00	8.00	-8.05	16.05	0.05
18.00	9.00	-9.05	18.05	0.05
20.00	10.00	-10.10	20.10	0.10
22.00	11.00	-11.10	22.10	0.10
24.00	12.00	-12.10	24.10	0.10
26.00	13.00	-13.10	26.10	0.10
28.00	14.00	-14.10	28.10	0.10
30.00	15.00	-15.10	30.10	0.10
32.00	16.00	-16.10	32.10	0.10
34.00	17.05	-17.10	34.15	0.15
35.80	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* Δp = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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เอกสารไม่ควบคุม

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-AFM-173
Request No : Req-2024-1833

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 158850
ID : UAE.EFM.038/2561

Accuracy : 0.75% 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 : 15 August 2024
Calibration Date : 28 August 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	Calibrator 3 High flow	18501012012	Sensodyne	1 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 Sensodyne 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 Luanquai
Service Calibration Engineer

Mr. Fari Mankavara
Calibration Engineer Supervisor

Issue Date : 28 August 2024

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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-173

Request No : Req-2024-1833

Decision Rule for Statements of Conformity

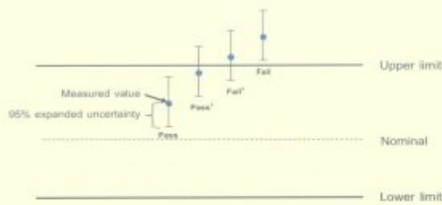
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G1:09 2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements.

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

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - 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

เอกสารไม่ควบคุม

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-173

Request No : Req-2024-1833

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)	MPE (l/min)	Result
25.60	99.80	14.50	14.46	-0.04	0.20	0.109	N/A
25.60	99.80	15.00	14.95	-0.05	0.21	0.113	N/A
25.50	99.70	15.80	15.73	-0.07	0.22	0.119	N/A
25.40	99.60	16.67	16.59	-0.08	0.23	0.125	N/A
25.50	99.50	18.30	18.20	-0.10	0.26	0.137	N/A

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : 25 °C, 101.3 kPa, Air
- 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 not 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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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 of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-TPM-390
Request No : Req-2024-1833
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 158850
Resolution : 0.1 °C
ID Number : UAE.EFM.038/2561

Range Calibration : 20 °C to 50 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 15 August 2024
Calibrated Date : 29 August 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO-GINGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QR24-0478.

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By :

Mr. Noppadon Luanquai
Technical Manager

Issue Date :

29 August 2024

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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-TPM-01 Rev.01 Issue date 13/02/20

Calibration Date: Certificate No.: 24-TP50-301
UUC Adjustment: Not Adjust Request No.: Req-2024-1832
Page: 2/2

Result of Calibration:

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
Ta	20.031	20.0	0.0	0.13
	25.034	25.1	-0.1	0.13
	30.035	30.1	-0.1	0.13
	35.029	35.1	-0.1	0.13
	40.011	39.9	+0.1	0.13
	45.008	44.8	+0.2	0.13
Tt	50.007	49.8	+0.2	0.13
	20.031	19.9	+0.1	0.13
	25.034	24.9	+0.1	0.13
	30.035	30.0	0.0	0.13
	35.029	35.1	-0.1	0.13
	40.011	40.1	-0.1	0.13
	45.008	45.2	-0.2	0.13
	50.007	50.2	-0.2	0.13

End of Certificate

Calibrated By:

Mr. Sirachak Jongsakdeesakul

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The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FIM-708-TP50-01 Rev.01 Issue date: 13/02/20



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



Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE-ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 : Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024
2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.				
3.This result of calibration was made on requested at the point specified by customer.				
4.This result of calibration instrument was in absolute pressure.				
5.This instrument was used clean air as pressure media.				
6.The certificate is valid only to the item calibrated on date and place of calibration.				
7.This Certification is traceable to the International System of Unit maintained through:-				
-National Institute of Metrology Thailand (NIMT)				

Calibrated by: Suksan Khankaew
Issue Date: 23 April 2024

Approved Signatory: [] Phalinee Pratpaipal
[] Sura Suwannasri
[✓] Attapol Panurach

เอกสารไม่ควบคุม



Cert.No.: 24P1367
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure	Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0	
Error (hPa)		2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure	Applied Pressure (hPa)	1032.61	1021.84	1010.68	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0	
Error (hPa)		-2.61	-1.84	-0.68	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa
* UUC = Unit Under Calibration

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

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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: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 24H756
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE-ANV.131/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024
2.The 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 maintained through:-				
-Thunder Scientific Corporation, NVLAB Accreditation No, Calibration 20058240				
-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No, Calibration 0008				

Calibrated by: Chakrit Waewwanjua
Issue Date: 18 April 2024

Approved Signatory: [] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnoppol Harachai

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Cert. No.: 24H756
Page.: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.0	-0.032	0.72
29.997	30.0	0.003	0.72
35.010	34.5	-0.510	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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MULTI-POINT GAS TEST REPORT

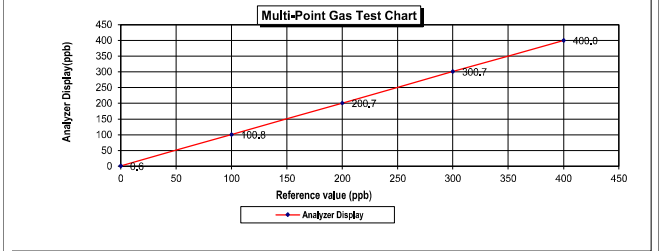
Test Date : Nov 1, 2023

Equipment :	Gas Analyzer (NO ₂)	Model :	42i
Manufacturer :	Thermo Scientific	Serial Number :	CM19050149

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 21, 2024		

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,6	0,60	0,60	0,60
Level 2	20,00%	100,0	100,8	0,80	0,79	0,79
Level 3	40,00%	200,0	200,7	0,70	0,35	0,35
Level 4	60,00%	300,0	300,7	0,70	0,23	0,23
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range			500,0 ppb	Average Difference (%)		0,40



01 / Nov / 2023

01 / Nov / 2023

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เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

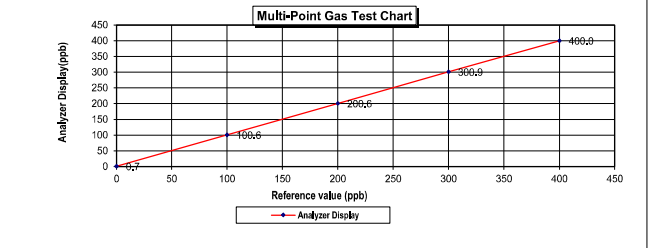
Test Date : Nov 1, 2023

Equipment :	Gas Analyzer (NO ₂)	Model :	42i
Manufacturer :	Thermo Scientific	Serial Number :	CM19050150

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 21, 2024		

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,7	0,70	0,70	0,70
Level 2	20,00%	100,0	100,6	0,60	0,60	0,60
Level 3	40,00%	200,0	200,6	0,60	0,30	0,30
Level 4	60,00%	300,0	300,9	0,90	0,30	0,30
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb	Average Difference (%)			0,38



01 / Nov / 2023

01 / Nov / 2023

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เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	AIR LIQUIDE (THAILAND)
Part Number:	E05N191E15A0014
Cylinder Number:	EB0162121
Laboratory:	124 - Plumsteadville - PA
PGVP Number:	A12023
Gas Code:	CO, CO ₂ , NO, NO ₂ , SO ₂ , BALN
Reference Number:	160-402772205-1
Cylinder Volume:	144.0 CF
Cylinder Pressure:	2016 PSIG
Valve Outlet:	560
Certification Date:	Jul 06, 2023
Expiration Date:	Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards (May 2012)" document EPA 603/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	±0.5% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	±0.5% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	±1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	±0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	±1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	99.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2219101	APE1614048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	99.52 PPM NITRIC OXIDE/NITROGEN	±0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	±1.5%	Feb 17, 2023
GMIS	15340202002	EB0130037	9.993 PPM NITROGEN DIOXIDE/NITROGEN	±1.6%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	±0.9%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025
The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet iS50 FTIR AUP2010245 CO2	FTIR		Jun 15, 2023		
SIEMENS ULTRAMATE N1-C8-180	NDIR		Jun 14, 2023		
Nicolet iS50 FTIR AUP2010245 NO	FTIR		Jun 29, 2023		
Nicolet iS50 FTIR AUP2010245 NO2	FTIR		Jun 15, 2023		
Nicolet iS50 FTIR AUP2010245 SO2	FTIR		Jun 08, 2023		

Approved for Release

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MULTI-POINT GAS TEST REPORT

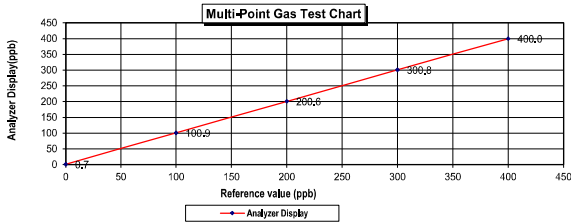
Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387065

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,7	0,70	0,70	0,70
Level 2	20,00%	100,0	100,9	0,90	0,89	0,89
Level 3	40,00%	200,0	200,6	0,60	0,30	0,30
Level 4	60,00%	300,0	300,8	0,80	0,27	0,27
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range		500,0 ppb		Average Difference (%)		0,43



MULTI-POINT GAS TEST REPORT

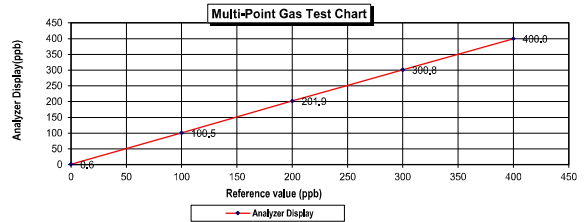
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906876

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,6	0,60	0,60	0,60
Level 2	20,00%	100,0	100,5	0,50	0,50	0,50
Level 3	40,00%	200,0	201,9	1,90	0,94	0,94
Level 4	60,00%	300,0	300,8	0,80	0,27	0,27
Level 5	80,00%	400,0	400,0	0,00	0,00	0,00
Remark : Measuring Range			500,0 ppb	Average Difference (%)		0,46



Airgas Specialty Gases
Airgas USA LLC
6141 Station Road
Plumsteadville, PA 19049
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144,0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with EPA Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMIS	16340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.6%	Sep 29, 2025
NTRM	160102-22	KAL000820	97.99 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 08, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025

The SRM, NTRM, PRM, or ROW noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023



United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

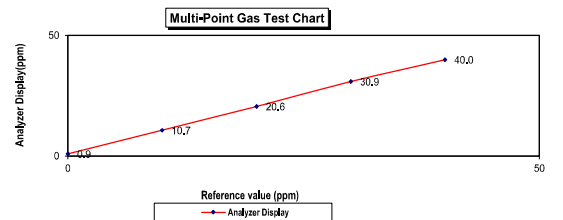
Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-69160-362

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,9	0,9	0,9	0,9
Level 2	20,00%	10,0	10,7	0,7	6,5	6,5
Level 3	40,00%	20,0	20,6	0,6	2,9	2,9
Level 4	60,00%	30,0	30,9	0,9	2,9	2,9
Level 5	80,00%	40,0	40,0	0,0	0,0	0,0
Remark : Measuring Range			50,0 ppm	Average Difference (%)		2,65



MULTI-POINT GAS TEST REPORT

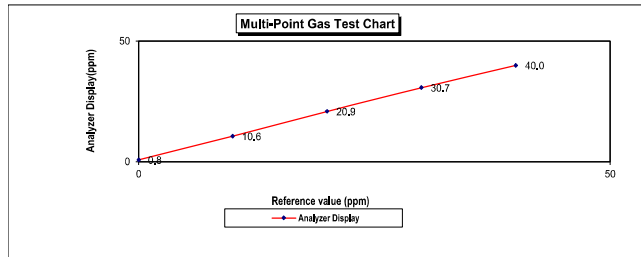
Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-65506-348

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44,68 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45,94 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984,8 PPM		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

	Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,0	0,8	0,8	0,8	0,8
Level 2	20,00%	10,0	10,6	0,6	5,7	5,7
Level 3	40,00%	20,0	20,9	0,9	4,3	4,3
Level 4	60,00%	30,0	30,7	0,7	2,3	2,3
Level 5	80,00%	40,0	40,0	0,0	0,0	0,0
Remark : Measuring Range 50,0 ppm			Average Difference (%)			
			:Acceptable Limit \pm 5%			



.....8...../.....12...../.....2023.....8...../.....Dec...../.....2023

เอกสารไม่ควบคุม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD---
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards" (May 2012) document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.992 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104020308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE161404B	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340502002	E90130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.9%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The SWM, NTRM, PRM, or RQM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet i550 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet i550 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet i550 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet i550 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

Approved for Release

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MULTI-POINT GAS TEST REPORT

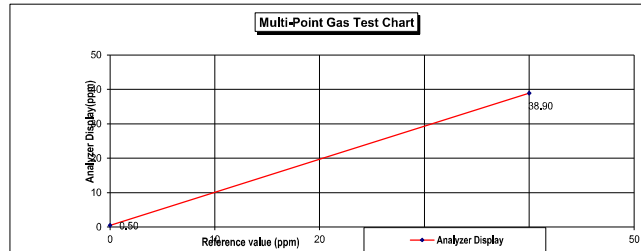
Test Date : Dec 21, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : T4FG19AN

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH ₄)	39,8 PPM	Serial Number :	
Carbon Monoxide (CO)	- PPM		
Cylinder No. :	D824432		
Expiration Date :	Aug 4, 2028		

Multi-point gas test data

	Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,00	0,50	0,50	0,50	0,50
Level 2	80,00%	40,00	38,90	-1,10	-2,83	-2,83
Remark : Measuring Range 50,00 ppm			Average Difference (%)			
			:Acceptable Limit \pm 5%			



.....21...../.....12...../.....2023.....22...../.....Dec...../.....2023

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MULTI-POINT GAS TEST REPORT

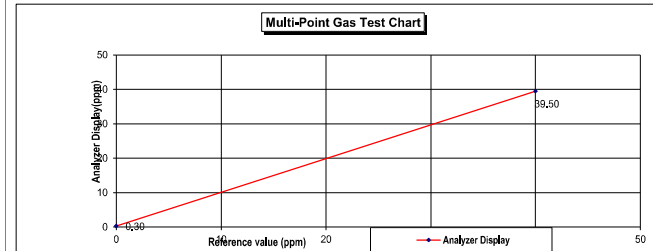
Test Date : Dec 15, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : HAMEHU5M

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH ₄)	39,8 PPM	Serial Number :	
Carbon Monoxide (CO)	- PPM		
Cylinder No. :	D824432		
Expiration Date :	Aug 4, 2028		

Multi-point gas test data

	Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0,00	0,30	0,30	0,30	0,30
Level 2	80,00%	40,00	39,50	-0,50	-1,27	-1,27
Remark : Measuring Range 50,00 ppm			Average Difference (%)			
			:Acceptable Limit \pm 5%			



.....15...../.....12...../.....2023.....16...../.....Dec...../.....2023

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Certificate Of Analysis Special Gases Mixture

Customer Details
Name: United Analyst & Engineering Co., Ltd.
Address: 31 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khet-Phra Khanong, Bangkok 10260
Customer Tag No.:

Certificate Details
Number: 3384/20
Date of Issue: 4-Aug-2020
Expiry date: 4-Aug-2028
Material Details
Production Order: 90161442
Material Code: 400400-AL-34
Cylinder No.: DB24432
Gas content: 6.60 M³
Filling pressure: 137.0 bar
Valve: CGA 510 BRASS
Cylinder Owner: LINDE
Cylinder Material: Aluminum
Cylinder Size: 50 L

Laboratory Report

Component	Normal Concentration	Analytical Result	Uncertainty ²	Method of Analysis ³	Assay Date
Methane in Air	40.0 ppm	39.8 ppm	± 1% relative	(6) I-PB-51.3	4-Aug-2020

Reference Standard
Methane in Nitrogen

Reference Standard used in Assay
Cylinder number: 2559956
Concentration: 49.29 ± 0.39 ppm
Expiry date: 4-09-2020

Analytical Instruments used in Assay
Instrument/Make/Model: FTIR Spectrometers Nicolet 650
Analytical Principle: FTIR-CH4
Last Multipoint Calibration: 4-Aug-2020

Recommend usage condition
Minimum utilization: 5% of actual content or before expiry date whichever comes first.
Storage condition: Keep in well ventilation and secure area.
Comments
When reordering, please quote the material number

Note:
1. All results expressed in this report are an analytical basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Methodology Protocol (EPA 821-R-12-001) for the Assay and Certification of Special Gas Standards using air as a carrier.
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to two National Standards of Mass at different recognized national metrology institutes.
3. (1) Gas Chromatography, (2) Magnetic Oxygen Analyser, (3) Electrochemical Oxygen Analyser, (4) Electrochemical Methane Analyser, (5) Total Hydrocarbon Analyser, (6) Other - specified

Page 1 of 1
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United Analyst & Engineering Co., Ltd.
15/15 Moo 1, Bang Na Road, Bang Na District, Bangkok 10260
Tel: (02) 578-0353-4 Fax: (02) 578-2672 www.uec.co.th E-mail: sales@uec.co.th
Business hours: 09:00-18:00 (Mon-Fri) 09:00-17:00 (Sat) 09:00-17:00 (Sun)
Branch office: 101/101 Moo 1, Bang Na Road, Bang Na District, Bangkok 10260
Tel: (02) 578-0353-4 Fax: (02) 578-2672



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 55 Soi Praset Manuk 29 Yaek 4, Praset Manuk Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sales@cal-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
CLID. NO. : 252000350
JOB CONTROL NO. : 240406037354
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 06 April 2024

DATE OF ISSUED : 10 April 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsontorn
Authorized Signatory
10 April 2024



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24037354
F3-011-05/12-23

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page 1 of 1
quick calibration



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 55 Soi Praset Manuk 29 Yaek 4, Praset Manuk Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sales@cal-lab.com



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 55 Soi Praset Manuk 29 Yaek 4, Praset Manuk Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sales@cal-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
DATE OF CALIBRATION : 08 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N: 29320
- Universal Counter, Hewlett Packard Model 5315A S/N: 2448A17042
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N: 397018, 2434988

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2.00 which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24037354
F3-011-05/12-23

page 2 of 4

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CALIBRATION LABORATORY Co., LTD.

210-11, 14, 55 Soi Praset Manuk 29 Yaek 4, Praset Manuk Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.com E-mail: sales@cal-lab.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.295	+0.005	1.9
0.4	50 Hz		0.400	0.394	+0.006	1.6
0.5	50 Hz		0.500	0.493	+0.007	1.6
0.6	50 Hz		0.600	0.593	+0.007	2.5
0.7	50 Hz		0.700	0.692	+0.008	2.5
0.3	100 Hz	peak	0.300	0.296	+0.004	1.9
0.4	100 Hz		0.400	0.395	+0.005	1.6
0.5	100 Hz		0.500	0.494	+0.006	1.6
0.6	100 Hz		0.600	0.594	+0.006	2.5
0.7	100 Hz		0.700	0.693	+0.007	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	2.989	+0.011	1.8
4	50 Hz		4.000	3.981	+0.019	1.8
5	50 Hz		5.000	4.962	+0.038	1.8
6	50 Hz		6.000	5.939	+0.061	1.8
7	50 Hz		7.000	6.924	+0.076	1.8
*3	100 Hz	peak	3.000	2.983	+0.017	1.6
*4	100 Hz		4.000	3.972	+0.028	1.6
*5	100 Hz		5.000	4.956	+0.044	1.6
*6	100 Hz		6.000	5.929	+0.071	1.5
*7	100 Hz		7.000	6.919	+0.081	1.5

Certificate No. Q24037354
F3-011-05/12-23

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CALIBRATION LABORATORY CO.,LTD.

2/10-11,14,55 Soi Praset Manuk 29 Yaek 4, Praset Manuk Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2572 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.059	+0.001	1.8
0.07	50 Hz		0.070	0.069	+0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.059	+0.001	1.8
0.07	100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24037354

F3-011-05/12-23

page 4 of 4

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idcalibration

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO.,LTD. HEAD OFFICE
7/19 MOO 13, SOUSUNTHAKORN 11 TAMBON BANG KALAI,
AMPHOE BANG PHU LAMUET, PRAKARN PROVINCE 10540 THAILAND
TEL : 0668-2116-5868-1 FAX: 0668-2116-7146



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : SVANTEK Range : 94 , 114 dB / 1000 Hz
Model : SV 36 Instrument Status : Used
Serial Number : 107224
ID : UAE-EFM.171/2564

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	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

Mr. Pait Mathavorn
Calibration Engineer Supervisor

Issue Date : 26 June 2024

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

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INA-T08-ACT-02 Rev.03 Issue date 5/6/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO.,LTD. HEAD OFFICE
7/19 MOO 13, SOUSUNTHAKORN 11 TAMBON BANG KALAI,
AMPHOE BANG PHU LAMUET, PRAKARN PROVINCE 10540 THAILAND
TEL : 0668-2116-5868-1 FAX: 0668-2116-7146



Page 2 of 3

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Calibration Results : Without Adjustment

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	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	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
114 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	0.24	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	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

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

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INA-T08-ACT-02 Rev.03 Issue date 5/6/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO.,LTD. HEAD OFFICE
7/19 MOO 13, SOUSUNTHAKORN 11 TAMBON BANG KALAI,
AMPHOE BANG PHU LAMUET, PRAKARN PROVINCE 10540 THAILAND
TEL : 0668-2116-5868-1 FAX: 0668-2116-7146



Page 3 of 3

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Decision Rule for Statements of Conformity

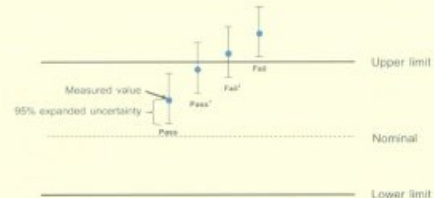
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statement.

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

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limits.

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



End of Calibration

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

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INA-T08-ACT-02 Rev.03 Issue date 5/6/24



Certificate No.: CP20240290EA
Operation No.: CP2024070253

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)

Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)

ID No.: UAE.EFM.039/2566

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260

Received Date: 25 July 2024

Calibrated Date: 5 - 6 August 2024

Issued Date: 7 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Page 1 of 6

F-CAL-004 Ed.1

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Certificate No.: CP20240290EA

Calibration Report

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)

Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)

ID No.: UAE.EFM.039/2566

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

Page 2 of 6

F-CAL-005 Ed.1

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Certificate No.: CP20240290EA

Calibration Report

Function : 2. Self-generated Noise
2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.7
C-weighting	28.4
Z-weighting	34.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.0	0.0	±1.0
1000	-0.1	-0.1	-0.1	±0.7
8000	-0.4	-0.5	-0.4	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	0.0	+2.5; -16.0

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1



Certificate No.: CP20240290EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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เอกสารไม่ควบคุม

Certificate No.: CP20240290EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0 ; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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เอกสารไม่ควบคุม

Certificate No.: CP20240290EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.6	142.6	0.0	±1.5

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1

เอกสารไม่ควบคุม

Certificate No.: CP20240322EA
Operation No.: CP2024080293

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)

ID No.: UAE.EFM.040/2566

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Soi Udumsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260

Received Date: 9 August 2024

Calibrated Date: 22 - 26 August 2024

Issued Date: 28 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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เอกสารไม่ควบคุม

F-CAL-004 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)

ID No.: UAE.EFM.040/2566

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Pressure: (101.3 ± 1.5) kPa

Method of Calibration :- IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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F-CAL-005 Ed.1

เอกสารไม่ควบคุม

Certificate No.: CP20240322EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
29.4

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	29.0
C-weighting	28.9
Z-weighting	35.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.2	±1.0
1000	0.3	0.3	0.3	±0.7
8000	-0.6	-0.5	-0.5	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.1	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	-0.1	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240322EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.6	-0.4	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.8	-0.2	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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Certificate No.: CP20240322EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAEq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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Certificate No.: CP20240322EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.6	-0.4	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.8	-0.2	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

Certificate No.: CP20240322EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.0	142.8	-0.2	±1.5

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25
2	Analytical Balance	SUSPENDED SOLIDS TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25
4	Digestion Units	TOTAL KJELDAHL NITROGEN	Foss Tecator	2520 Auto / 91794469	National Food Institute Ministry of Industry, Thailand	2402957-001-02	23 May 24	22 May 25
5	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25
6	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25
7	pH Meter	pH	Horiba	LAQUA-PH210 / HA0E0009	technology promotion association (thailand-japan)	24CH238	20 Feb 24	19 Feb 25

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khitt Ruttanaprapachai
Approved by :
() Ponpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used : Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Cert.No.: 24MM292
Page: 2 of 3

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15864	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certificate is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

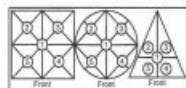
1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading (g)
0.0001

2. Effect of off center loading
A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร
ศูนย์บริการทดสอบวิชาการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr. Phongsakorn Tsamrit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

FCS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 **Page 2 of 4**

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-M-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	850567372	TCS	M0304535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH-016/23	Quality Reborn	QR24-0343	9 February 2025

3. This calibration is traceable to SI UNIT

4. This certificate is certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

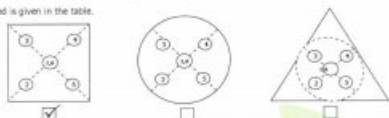
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

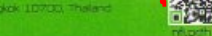
The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

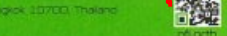
Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (+ g)	Coverage Factor
Unload	0.00000	0.00000	0.00000	0.0000086	2.00
0.001	0.001000	0.00101	-0.00001	0.0000089	2.00
0.005	0.005000	0.00500	0.00000	0.0000092	2.00
0.01	0.010000	0.01000	0.00000	0.0000089	2.00
0.05	0.049999	0.05000	0.00000	0.0000096	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000002	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000021	20.00000	0.00002	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000028	50.00002	0.00001	0.000068	2.00
80	80.000008	80.00002	0.00005	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

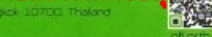
Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (+ g)	Coverage Factor
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL. 0-2717-3900 FAX. 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
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 : Walailak Sirthean
Approved by : [Signature]
() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai
Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

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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เอกสารไม่ควบคุม

Verification Certificate

Substitute for Certificate No.: 2402957-001-01
Certificate No.: 2402957-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
Manufacturer: FOSS
Model: 2520
Serial No.: 91794469
ID No.: UAE.WAS.011/2560
Order No.: 2402957
Operation No.: 2402957-001
Date of Receipt: 23 May 2024
Date of Calibration: 23-24 May 2024

Calibrated by Mr.Jerawut Prapawuttipong Scientist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 18 June 2024

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

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

F-CS-011 Revision: 01 Date: 20-04-65

2008 Soi 36, Aun Aun Road, Bang Yai Khwa Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 0600 Fax : +66(0) 2422 0545
เอกสารไม่ควบคุม



Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 23-24 May 2024

Page 2 of 4

Location: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition:
Ambient Temperature (25 ± 3) °C
Relative Humidity (55 ± 15) %
Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A Type R	HYD8535/MS119H3 TCR10-101 / CH181-103	TC23/004B	2-Jun-2024	N.M. Technical Center Laboratory

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC* Description

Time of Record - Hour 30 Minute At 380 °C

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

2008 Soi 36, Aun Aun Road, Bang Yai Khwa Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 0600 Fax : +66(0) 2422 0545
เอกสารไม่ควบคุม



Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 23-24 May 2024

Page 3 of 4

Calibration point:

380 °C

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	378.86	2.1
2	380	380	0.40	378.41	2.1
3	380	380	1.18	378.94	2.1
4	380	380	0.44	377.64	1.6
5	380	380	0.11	377.75	1.6
6	380	380	0.14	378.35	1.6
7	380	380	1.17	377.09	2.1
8	380	380	0.33	377.08	2.1
9	380	380	0.14	376.61	2.1
10	380	380	0.96	377.74	2.1
11	380	380	0.40	377.17	2.1
12	380	380	1.18	377.71	2.1
13	380	380	0.44	379.07	1.6
14	380	380	0.11	379.19	1.6
15	380	380	0.14	379.78	1.6
16	380	380	1.17	378.74	2.1
17	380	380	0.33	378.74	2.1
18	380	380	0.14	378.27	2.1
19	380	380	0.96	379.53	2.1
20	380	380	0.40	378.96	2.1

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

F-CS-012 Revision: 01 Date: 20-04-65

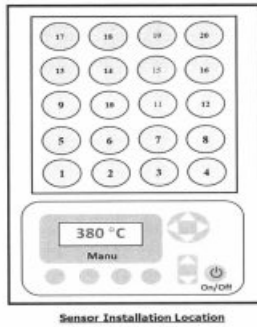
2008 Soi 36, Aun Aun Road, Bang Yai Khwa Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 0600 Fax : +66(0) 2422 0545
เอกสารไม่ควบคุม



Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 23-24 May 2024 Page 4 of 4
Calibration point: 380 °C
Calibration result: Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Remark: Edited Date of Calibration from 23-24 May 2024 to 23-24 May 2024.

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

***** End *****

FCS-012 Revision: 01 Date: 20-04-65



FOSS

Customer Service Report

Date: 9 Feb 2024
Customer: UAE
Instrument: KJ200
Address: BANGKOK
Serial: 91790524
Hours Start: 08:00
Finish: 09:30
Travel To Customer: 1 hr
Labour: 08:00 - 09:00
Travel From Customer: 1 hr

Application	Special	Standard
Normal	Courtesy Visit	Installation
Distributor	PMA Onboarding	Quote
Internal	Warranty	Repair
Digital Service	Sales Support	Remote
		Training
		In House
		PM
		Other

PO/Quote Number: If applicable
PMA Type: FOSSENT If applicable
Contract No.: If applicable

Details of Work / Test	Condition / Status
# PM KJ200 - ตรวจสอบเครื่องวัด pH - ตรวจสอบอุณหภูมิ 3 min 100 mL - Balance 50 mL - 80 mL - ตรวจสอบ pH kit - ตรวจสอบอุณหภูมิ	done
# 10000 325 Sphat neck complete 1 PC	
Instrument Ready for Use	OK / Not OK

Part No.	Batch	Description	Qty
1009965	14.12.2020	Foss pH kit let 100 let 100 Analysis 100	1

Would you be willing to participate in a brief survey in order to tell us how we performed? Email

FOSS

Customer Service Report

FOSS South East Asia
3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110
Report No: 9807
Address: BANGKOK
Serial: 91889052

Date: 8-9 Feb 2024
Customer: UAE
Instrument: KJ100
Hours Start: 08:00
Finish: 09:30
Travel To Customer: 1.5 hr
Labour: 09:50 - 10:00
Travel From Customer: 1.5 hr

Application	Special	Standard
Normal	Courtesy Visit	Installation
Distributor	PMA Onboarding	Quote
Internal	Warranty	Repair
Digital Service	Sales Support	Remote
		Training
		In House
		PM
		Other

PO/Quote Number: If applicable
PMA Type: FOSSENT If applicable
Contract No.: If applicable

Details of Work / Test	Condition / Status
# PM KJ100 - ตรวจสอบเครื่องวัด pH - ตรวจสอบอุณหภูมิ 50 - 50 mL - Balance 50 mL - 80 mL - ตรวจสอบ pH kit - ตรวจสอบอุณหภูมิ - ตรวจสอบ pH kit - ตรวจสอบอุณหภูมิ	done
Balance - 0.1g Precision - 0.01g	
Instrument Ready for Use	OK / Not OK

Part No.	Batch	Description	Qty
60031807	13-10-2023	Foss pH kit 8100/8100 12-00	1

I confirm this report is accurate and complete

Would you be willing to participate in a brief survey in order to tell us how we performed? Email

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert.No.: 24CH238
Page.: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Horiba
Model: LAQUA-PH210
Serial No.: HADE0009
ID No.: UAE.EFM.071/2564(EFM.pH.04/64)
Condition As-Received: Used Item
Received Date: 19 February 2024
Calibration Date: 20 February 2024
Reference: 2402-0594WC-2
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
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)
- CP-CH8 by comparison with temperature standard

Calibrated by: Waladek Siddhean

Approved by: Approved Signatory

() Ponthippa Tameyakul
() Unnophol Harachai
(✓) Saitip Meangmai

Issue Date: 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 24CH238
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	23E2602	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 6.866	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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: HA0E0009	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00



Cert.No.: 24CH238
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

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.: 992C0006	4.008	4.02	149.4	0.0086	2.05
	6.986	7.00	-24.4	0.0093	2.00
	6.986	7.00	-25.0	0.0093	2.00
	9.997	10.00	-196.7	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :	9625
- Serial No. :	992C0006
Dimension of probe	
- Length :	110 mm.
- Diameter :	16 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	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	0.13	2.00

Remark - UUC* = Unit Under Calibrator

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

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a 1203153

a 1203293

เอกสารสอบเทียบเครื่องมือ

ประจำเดือนพฤศจิกายน พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 1901	Jiranatee Associates Co., Ltd.	COF-002-66	14 Jul 23	13 Jul 25	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 160491	Innovative Instrument Co.,Ltd.	24-AFM-193	23 Sep 24	22 Sep 25	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H753	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Environmental Instrument	42C 42C-78933-390	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920005	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i JC1606001758	UAE Consultant Co.,Ltd.	09112023	9 Nov 23	8 Nov 24	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1191503040	UAE Consultant Co.,Ltd.	09112023	9 Nov 23	8 Nov 24	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Horiba	APMA-370 YRLHTB7G	UAE Consultant Co.,Ltd.	08122023	8 Dec 23	7 Dec 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-65506-348	UAE Consultant Co.,Ltd.	08122023	8 Dec 23	7 Dec 24	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 PDXEGXF7	UAE Consultant Co.,Ltd.	21122023	21 Dec 23	20 Dec 24	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 SSGEJYBJ	UAE Consultant Co.,Ltd.	15122023	15 Dec 23	14 Dec 24	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11058	Calibration Laboratory Co.Ltd	Q24037354	8 Apr 24	7 Apr 25	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV36 107224	Innovative Instrument Co.,Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
20	Sound Level Meter	L _{Aeq} 1 hr, L _{Aeq} 24 hrs, L _{Amax} , L _{A90} เสียงรบกวน	Larson Davis	LxT1 0007306	Electrical And Electronics Institute Foundation For Industrial Development	CP20240290EA	5 Aug 24	4 Aug 25	-
21	Sound Level Meter	L _{Aeq} 1 hr, L _{Aeq} 24 hrs, L _{Amax} , L _{A90} เสียงรบกวน	Larson Davis	LxT1 0007308	Electrical And Electronics Institute Foundation For Industrial Development	CP20240322EA	22 Aug 24	21 Aug 25	-

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	γ	Standard Flow [Qs] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	1.273	0.648
2	0.997	754.083	23.80	23.23	61.350	3.236	1.795	0.914
3	1.121	754.005	23.81	23.20	41.923	4.938	2.075	1.057
4	1.172	754.004	23.72	23.16	30.933	4.891	2.308	1.122
5	1.410	753.994	23.76	23.18	29.435	7.159	2.671	1.352

Slope (a): 1.98463
Intercept (b): -0.01638
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	γ	Standard Flow [Qs] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	0.800	0.651
2	0.997	754.083	23.80	23.23	61.350	3.236	1.129	0.917
3	1.121	754.005	23.81	23.20	41.923	4.938	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.236
5	1.410	753.994	23.76	23.18	29.435	7.159	1.879	1.357

Slope (a): 1.24305
Intercept (b): -0.01029
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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CERTIFICATE OF CALIBRATION

Certificate No. : COF-002-66

Page 3 of 2 Pages

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

: Top Load Orifice
: Andersen Instruments
: G25A
: 1901
: UAE.ANV.051/2547
: Used Item
: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

Calibration procedure:
The Orifice gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G65/JAC/W2-60. The W2-60-004
was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the
measurement to recognition of the national
standards and to realization of the international
system of units (SI) through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: G2215902

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)

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 07 Jul 2023
: 14 Jul 2023
: 18 Jul 2023

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.9 °C and 54.5%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:

☐ Mr. Sorawit Thachad
☒ Miss Jiraporn Lertsomphol



Approved sign:

Calibration Department Manager

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



Cert.No.: 24P1250
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure		UUC Indication		ΔP	Error
High-port side	Low-port side	High-port side	Low-port side		
0.00	0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00	0.00
4.00	2.00	-2.00	4.00	0.00	0.00
6.00	3.00	-3.00	6.00	0.00	0.00
8.00	4.00	-4.00	8.00	0.00	0.00
10.00	5.05	-4.95	10.00	0.00	0.00
12.00	6.05	-5.95	12.00	0.00	0.00
14.00	7.05	-6.95	14.00	0.00	0.00
16.00	8.10	-7.95	16.05	0.05	0.05
18.00	9.10	-8.95	18.05	0.05	0.05
20.00	10.10	-9.95	20.05	0.05	0.05
22.00	11.10	-10.95	22.05	0.05	0.05
24.00	12.10	-11.95	24.05	0.05	0.05
26.00	13.15	-12.95	26.10	0.10	0.10
28.00	14.15	-13.95	28.10	0.10	0.10
30.00	15.20	-14.95	30.15	0.15	0.15
32.00	16.20	-15.95	32.15	0.15	0.15
34.00	17.20	-16.95	34.15	0.15	0.15
35.50	18.00	-17.70	35.70	0.20	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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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. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No. : 24P1250
Page : 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.076/2566

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.

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 10 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Praptraipal
[] Sura Suwannasri
[✓] Attapol Panurach

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Certificate No : 24-AFM-193
Request No : Req-2024-2119

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)	MPE (l/min)	Result
25.40	100.00	14.50	14.54	0.04	0.20	0.109	N/A
25.30	99.90	15.00	15.03	0.03	0.21	0.113	N/A
25.20	99.80	15.80	15.81	0.01	0.22	0.119	N/A
25.10	99.80	16.67	16.68	0.01	0.23	0.125	N/A
25.00	99.70	18.30	18.27	-0.03	0.26	0.137	N/A

Note: STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : 25 °C, 101.3 kPa, Air
- 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.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.04 Issue date 17/6/24

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Certificate of Calibration

Certificate No : 24-AFM-193
Request No : Req-2024-2119

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 160491
ID : UAE.EFM.175/2561

Accuracy : 0.75% 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 kPa ± 10 hPa
Received Date : 10 September 2024
Calibration Date : 23 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 High flow	18501012012	Sensidyne	1 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

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

Note :

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

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Mr. Pait Mahavithin
Calibration Engineer Supervisor

Issue Date : 23 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

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Certificate of Calibration

Certificate No : 24-TPM-441
Request No : Req-2024-2119
Page : 1/2

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Unit Under Calibration Details

Calibration Parameter : Temperature

Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 160491
Resolution : 0.1 °C
ID Number : UAE.EFM.175/2561

Range Calibration : 20 °C to 50 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 10 September 2024
Calibrated Date : 25 September 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN:
08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.:
Calibration 0292

Note

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

Approved By :

Mr. Noppadon Luangart
Technical Manager

Issue Date :

25 September 2024
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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-TPM-01 Rev.01 Issue date 13/02/20

Certificate No : 24-AFM-193
Request No : Req-2024-2119

Decision Rule for Statements of Conformity

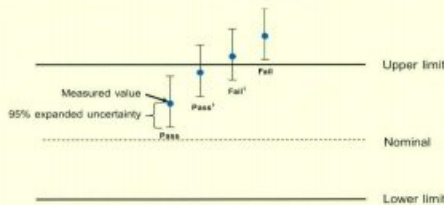
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09-2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.04 Issue date 17/6/24

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Certificate of Calibration

Certificate No. : 24P1367
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP1142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4.This result of calibration instrument was in absolute pressure.

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prabpai
[] Sura Suwannasri
[✓] Attapol Panurachi

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Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 24-TPM-441

Request No : Req-2024-2119

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
Ta	20.031	20.0	0.0	0.13
	25.034	25.0	0.0	0.13
	30.035	30.1	- 0.1	0.13
	35.029	35.1	- 0.1	0.13
	40.011	40.0	0.0	0.13
	45.008	45.0	0.0	0.13
Tf	50.007	50.0	0.0	0.13
	20.031	19.9	+ 0.1	0.13
	25.034	24.9	+ 0.1	0.13
	30.035	30.0	0.0	0.13
	35.029	35.0	0.0	0.13
	40.011	40.0	0.0	0.13
	45.008	44.9	+ 0.1	0.13
	50.007	49.9	+ 0.1	0.13

End of Certificate

Calibrated By :
Mr. Sitichok Jirapadeeskul

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.

PM-700-TPM-01 Rev-01 Issue date 15/02/28

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Certificate of Calibration

Certificate No. : 24H753
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.127/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	2311238	16 Oct 2024

2.The 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 maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :
[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval : 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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MULTI-POINT GAS TEST REPORT

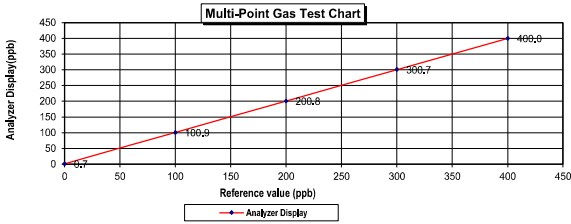
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Environmental Instruments Serial Number : 42C-78933-390

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.70	0.70	0.70
	20.00%	100.0	0.90	0.89	0.89
Level 3	40.00%	200.0	0.80	0.40	0.40
Level 4	60.00%	300.0	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.44



Calculate by

Approve by

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Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
61st Station Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD--
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Expiration Date: Jul 06, 2031
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 06, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 600/R-12/051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	±0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	±0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	±1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	±0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	±1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	±0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	±1.5%	Feb 17, 2023
GMIS	16340202002	E90130037	9.890 PPM NITROGEN DIOXIDE/NITROGEN	±1.5%	Sep 29, 2025
NTRM	160102-22	KAL002620	97.88 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CC475902	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025

The NTRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

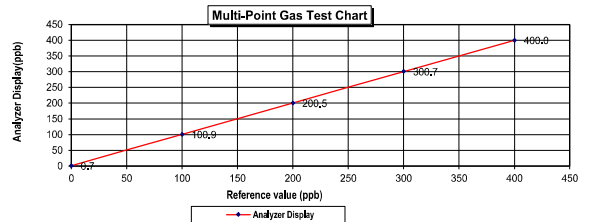
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920005

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.5	0.50	0.25	0.25
Level 4	60.00%	300.0	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.41



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MULTI-POINT GAS TEST REPORT

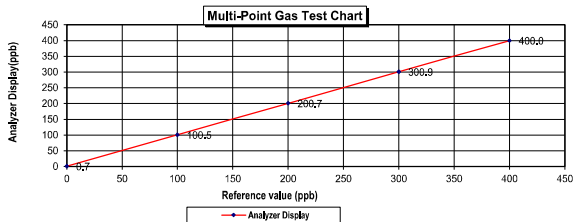
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1191503040

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.5	0.50	0.50	0.50
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.37



MULTI-POINT GAS TEST REPORT

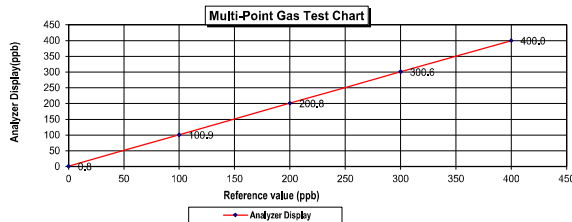
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : JC1606001758

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 24, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.80	0.80	0.80
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.8	0.80	0.40	0.40
Level 4	60.00%	300.0	300.6	0.60	0.20	0.20
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.46



MULTI-POINT GAS TEST REPORT

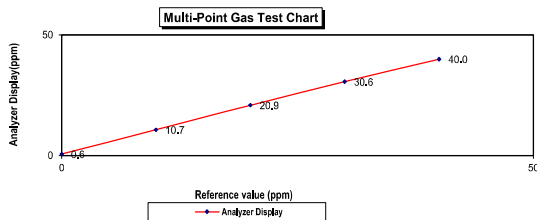
Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : APMA-370
Manufacturer : HORIBA Serial Number : YRLHTB7G

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.6	0.6	0.6
Level 2	20.00%	10.0	10.7	0.7	6.5	6.5
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.6	0.6	2.0	2.0
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)		2.68	



CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 560
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasware Calibration Standards" (May 2012) document EPA 803/R-12/51, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS						
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates	
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.5% NIST Traceable	06/27/2023, 07/06/2023	
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.5% NIST Traceable	06/27/2023, 07/06/2023	
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023	
CARBON MONOXIDE	200.0 PPM	195.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023	
CARBON DIOXIDE	8,000 %	7,992 %	G1	+/- 1.2% NIST Traceable	06/27/2023	
NITROGEN	Balance					
CALIBRATION STANDARDS						
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date	
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031	
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025	
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031	
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023	
GMIS	15340202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025	
NTRM	160102-22	KAL002820	97.98 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027	
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028	
NTRM	130608-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025	
The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.						
ANALYTICAL EQUIPMENT						
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration			
Nicolet i550 FTIR AUP2010245 CO ₂	FTIR		Jun 15, 2023			
SIEMENS ULTRAMATE6E N1-C8-180	NDIR		Jun 14, 2023			
Nicolet i550 FTIR AUP2010245 NO ₂	FTIR		Jun 29, 2023			
Nicolet i550 FTIR AUP2010245 NO ₂	FTIR		Jun 15, 2023			
Nicolet i550 FTIR AUP2010245 SO ₂	FTIR		Jun 08, 2023			

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

LTD--

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 660

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2021

Certification performed in accordance with "EPA Testability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 600/R-12/051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 28, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	16340202002	E90130037	9.690 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.5%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.88 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC455902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C6-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-65506-348

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Dilutor Detail

Manufacturer :	Thermo Scientific
Model :	146i
Serial Number :	1180540071

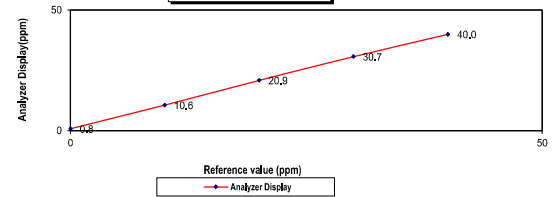
Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.8	0.8
Level 2	20.00%	10.0	10.6	5.7	5.7
Level 3	40.00%	20.0	20.9	4.3	4.3
Level 4	60.00%	30.0	30.7	2.3	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm

:Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 15, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : SSGEYBJ

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	-	PPM	Manufacturer :	
Nitric Oxide (NO)	-	PPM	Model :	
Methane (CH ₄)	39.8	PPM	Serial Number :	
Carbon Monoxide (CO)	-	PPM		
Cylinder No. :	D824432			
Expiration Date :	Aug 4, 2028			

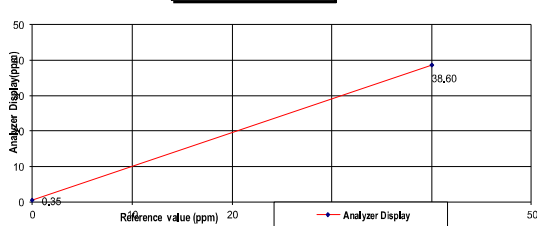
Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	0.35	0.35	0.35
Level 2	80.00%	40.00	38.60	-3.63	-3.63

Remark : Measuring Range 50.00 ppm

:Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



...15...../.....12...../.....2023.

.....16...../.....Dec...../.....2023.

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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Dec 21, 2023

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : PDXEGXF7

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	-	PPM	Manufacturer :	
Nitric Oxide (NO)	-	PPM	Model :	
Methane (CH ₄)	39.8	PPM	Serial Number :	
Carbon Monoxide (CO)	-	PPM		
Cylinder No. :	D824432			
Expiration Date :	Aug 4, 2028			

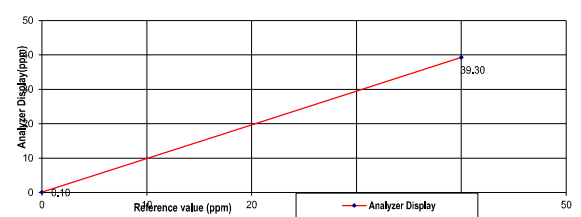
Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	0.10	0.10	0.10
Level 2	80.00%	40.00	39.30	-1.78	-1.78

Remark : Measuring Range 50.00 ppm

:Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



...21...../.....12...../.....2023..

.....22...../.....Dec...../.....2023..

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co.,LTD.

2110-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrae, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
CLID. NO. : 252000350
JOB CONTROL NO. : 240406037354
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 06 April 2024

DATE OF ISSUED : 10 April 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
10 April 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24037354

F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co.,LTD.

2110-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrae, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
DATE OF CALIBRATION : 08 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320
- Universal Counter, Hewlett Packard Model 5315A S/N. 3448A13042
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24037354

F3-011-05/12-23

page 2 of 4

Certificate No. Q24037354

F3-011-05/12-23

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAE-EFM.171/2564

Class : 1
Range : 94, 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	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

Mr. Pacit Mathavom
Calibration Engineer Supervisor

Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.059	+0.001	1.8
0.07	50 Hz		0.070	0.069	+0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.059	+0.001	1.8
0.07	100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24037354
F3-011-05/12-23

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Certificate No : 24-ACT-091
Request No : Req-2024-1380

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Decision Rule for Statements of Conformity

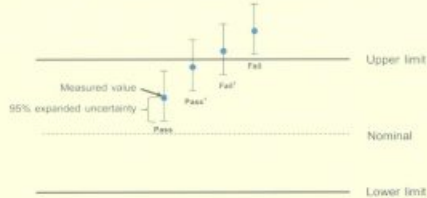
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019 Guidelines on the Reporting of Conformance with Specification as following Fig. and statements:

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

Pass⁵ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail - 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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

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Sound pressure level

Calibration Results : Without Adjustment

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	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	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
114 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	0.24	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
FM-708-ACT-02 Rev.03 Issue date 5/6/24

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240290EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)
ID No.: UAE.EFM.039/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240290EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240290EA

Operation No.: CP2024070253

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)
ID No.: UAE.EFM.039/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

(Mr. Sittichai Swaksuriyawong)

Group Manager

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The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)

providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240290EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.7
C-weighting	28.4
Z-weighting	34.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.0	0.0	±1.0
1000	-0.1	-0.1	-0.1	±0.7
8000	-0.4	-0.5	-0.4	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	0.0	+2.5; -16.0

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Certificate No.: CP20240290EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.6	142.6	0.0	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 1.
 4. The coverage factor $k = 2.00$

-- End of Report --

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Certificate No.: CP20240322EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)
ID No.: UAE.EFM.040/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

- Reference standards instrument for Acoustic function
- National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Certificate No.: CP20240290EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0 ; -3.0
LAE	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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Certificate No.: CP20240322EA

Operation No.: CP2024080293

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)

Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)

ID No.: UAE.EFM.040/2566

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Soi Udumsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260

Received Date: 9 August 2024

Calibrated Date: 22 - 26 August 2024

Issued Date: 28 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

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The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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Certificate No.: CP20240322EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.0	142.8	-0.2	±1.5

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
29.4

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	29.0
C-weighting	28.9
Z-weighting	35.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.2	±1.0
1000	0.3	0.3	0.3	±0.7
8000	-0.6	-0.5	-0.5	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.1	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	-0.1	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.6	-0.4	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0 ; -3.0
	0.25	130.0	0.0	±0.5
LAE	200	110.0	0.0	+1.0 ; -1.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.8	-0.2	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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Page 5 of 6

F-CAL-005 Ed.1

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25
2	Analytical Balance	SUSPENDED SOLIDS TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
3	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ARCO	UR-1320 / -	Technology Promotion Association (Thailand-Japan)	24TM587	1 Apr 24	31 Mar 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25
5	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25
6	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25
7	pH Meter	pH	Horiba	LAQUA-PH210 / HA0E0009	technology promotion association (thailand-japan	24CH238	20 Feb 24	19 Feb 25

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Porpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

- | Instruments | Model | Serial No. | ID No. | Test report No. | Due date |
|-----------------------------|-------|------------|---------|-----------------|-------------|
| 1) Standard Weight Set (E2) | 15864 | 24053 | 70RC007 | MM-0013-24 | 25 Jan 2026 |
- This certificate is valid only to the item calibrated on date and place of calibration.
 - This result of calibration was made on requested at the point specified by customer.
 - This certificate is not certified for any commercial transaction.
 - This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม

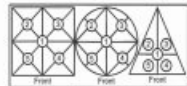


Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table



Maximum difference between
off-center and central loading
(g)
0.0001

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการทดสอบและมาตรฐานอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C009071872
ID No.: UAE.WAO.012/2563

Order No.: 2402283
Operation No.: 2402283-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Paprewattipong
Scientist

Approved by

(Mr. P.)

Manager, Division of Calibration Laboratory

Date of Issue: 9 April 2024

Responsible for the Technical Management Team

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR2050U

Serial No.: C009071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class E2 1mg to 200g 8005967572 TCS M23040525 8 April 2024

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter 608-H1 NFI.BTH 016/23 Quality Reborn QR24-0343 9 February 2025

3. This certification is traceable to SI UNIT

4. This calibration was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

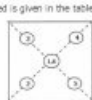
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑-๒๕๖๓ 36 หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี
2008 Soi 36, Anur Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545 nfi.co.th



Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR2050U

Serial No.: C009071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (+g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000088	2.00
0.001	0.001003	0.001011	-0.000008	0.0000091	2.00
0.005	0.005003	0.004999	0.000004	0.0000094	2.00
0.01	0.010003	0.010000	0.000003	0.0000091	2.00
0.05	0.049996	0.050000	0.000004	0.0000098	2.00
0.1	0.100001	0.100000	0.000001	0.000011	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	0.000022	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000009	10.000000	0.000009	0.000026	2.00
20	20.000031	20.000002	0.000029	0.000037	2.00
30	30.000049	30.000003	0.000046	0.000052	2.00
50	50.000028	50.000004	-0.000024	0.000068	2.00
80	80.000068	80.000005	0.000063	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑-๒๕๖๓ 36 หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี
2008 Soi 36, Anur Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545 nfi.co.th



Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR2050U

Serial No.: C009071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (+g)	Coverage Factor
90	90.00010	90.0000	0.00010	0.00015	2.00
100	100.00006	100.0000	0.00006	0.00015	2.00
110	110.00007	110.0000	0.00007	0.00017	2.00
120	120.00009	120.0000	0.00009	0.00018	2.00
130	130.00010	130.0000	0.00010	0.00019	2.00
140	140.00014	140.0000	0.00014	0.00020	2.00
150	150.00009	150.0001	0.00000	0.00020	2.00
160	160.00010	160.0001	0.00000	0.00022	2.00
170	170.00012	170.0001	0.00002	0.00023	2.00
200	200.00016	200.0000	0.00016	0.00028	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 %.

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑-๒๕๖๓ 36 หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี
2008 Soi 36, Anur Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545 nfi.co.th



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & 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.: 24TM587

Page : 1 of 3

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. :

ID No. : UAE.WAO.018/2551

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 01 April 2024

Calibration Date : 01 April 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisida Malee

Approved by :

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

Issue Date : 5 April 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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม
A 0065063



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2404-0004OC-1
Procedure Used :-

Cert. No.: 24TM587
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	MY57013711	23LM115	TPA	11 Jul 2024

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

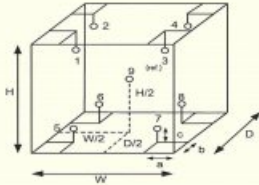
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :	
a = 10 cm	D = 0.62 m
b = 10 cm	W = 1.2 m
c = 10 cm	H = 1.2 m
	Capacity = 0.89 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	48	49
AC Supply (Volt)	221	220

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

เอกสารไม่ควบคุม
a 1209743



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2404-0004OC-1
Result of Calibration :- (*) Without Adjustment

Cert. No.: 24TM587
Page : 3 of 3

Function of UUC* : Temperature Source

Fresh air setting : Not Available

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	0.45	0.55	1.3	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.954	20.183	20.235	19.707	19.706	19.739	19.785	19.821	19.828	0.66

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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เอกสารไม่ควบคุม
a 1209742



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
334-4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
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 Sirthean

Approved by :

Approved signature

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 22 February 2024

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Cert.No.: 24TW39
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	-	1308U10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

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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เอกสารไม่

FOSS

Customer Service Report

Date:	9 Feb 2024
Customer:	UAE
Instrument:	K7100
Report No:	9810
Address:	BANGKOK
Serial:	91790524

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:00	09:00	10:00
Finish	09:30	10:00	10:30

Job Type					
Application	Special	Standard			
Normal	<input checked="" type="checkbox"/>	Courtesy Visit	<input checked="" type="checkbox"/>	Installation	<input checked="" type="checkbox"/>
Distributor	<input checked="" type="checkbox"/>	PMA Onboarding	<input checked="" type="checkbox"/>	Quote	<input checked="" type="checkbox"/>
Internal	<input checked="" type="checkbox"/>	Warranty	<input checked="" type="checkbox"/>	Repair	<input checked="" type="checkbox"/>
Digital Service	<input checked="" type="checkbox"/>	Sales Support	<input checked="" type="checkbox"/>	Remote	<input checked="" type="checkbox"/>

PO/Quote Number:		If applicable
------------------	--	---------------

PMA Type	FOSSC	If applicable	Contract No.		If applicable
----------	-------	---------------	--------------	--	---------------

Details of Work / Test	Condition / Status
# PM K7100	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง 3 min 100 mL	
- Adjust 50 mL - 80 mL	
- ตรวจสอบและปรับตั้ง kit	
- ตรวจสอบและปรับตั้ง	
# 10000 325 Seton Net Complete 1 PC	
Instrument Ready for Use	<input checked="" type="checkbox"/> OK <input type="checkbox"/> Not OK

Part No.	Batch	Description	Qty
10009965	14.12.2020	FOSS PM kit 1000 1000 1000 1000	1

Would you be willing to participate in a brief survey in order to tell us how we performed?	
---	--

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date:	8-Feb-2024
Customer:	UAE
Instrument:	K7100
Report No:	9807
Address:	BANGKOK
Serial:	91879052

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:00	09:00	10:00
Finish	09:30	10:00	10:30

Job Type					
Application	Special	Standard			
Normal	<input checked="" type="checkbox"/>	Courtesy Visit	<input checked="" type="checkbox"/>	Installation	<input checked="" type="checkbox"/>
Distributor	<input checked="" type="checkbox"/>	PMA Onboarding	<input checked="" type="checkbox"/>	Quote	<input checked="" type="checkbox"/>
Internal	<input checked="" type="checkbox"/>	Warranty	<input checked="" type="checkbox"/>	Repair	<input checked="" type="checkbox"/>
Digital Service	<input checked="" type="checkbox"/>	Sales Support	<input checked="" type="checkbox"/>	Remote	<input checked="" type="checkbox"/>

PO/Quote Number:		If applicable
------------------	--	---------------

PMA Type	FOSSC	If applicable	Contract No.		If applicable
----------	-------	---------------	--------------	--	---------------

Details of Work / Test	Condition / Status
# PM K7100	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง 3 min 100 mL	
- Adjust 50 mL - 80 mL	
- ตรวจสอบและปรับตั้ง kit	
- ตรวจสอบและปรับตั้ง	
# 10000 325 Seton Net Complete 1 PC	
Instrument Ready for Use	<input checked="" type="checkbox"/> OK <input type="checkbox"/> Not OK

Part No.	Batch	Description	Qty
60031807	13-10-2023	FOSS PM kit 8100/8100 12.00	1

Would you be willing to participate in a brief survey in order to tell us how we performed?	
---	--

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
514/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert.No.: 24CH238
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0E0009
ID No. : UAE.EFM.071/2564(EFM.pH.04/64)
Condition As-Received: Used Item
Received Date : 19 February 2024
Calibration Date : 20 February 2024
Reference : 2402-0594WC-2
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
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)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirinthean

Approved by : [Signature]

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 22 February 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.

A 0063840



Condition of this calibration result

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	23/908	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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HA0E0009	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

a 1203153



Cert.No.: 24CH238

Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

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 : 992C0006	4.008	4.02	149.4	0.0086	2.05
	6.986	7.00	-24.4	0.0093	2.00
	6.986	7.00	-25.0	0.0093	2.00
	9.997	10.00	-196.7	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9625
- Serial No. : 992C0006

Dimension of probe

- Length : 110 mm.
- Diameter : 16 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	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	0.13	2.00

Remark - UUC* = Unit Under Calibrator

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

-o0o-

a 1203293

เอกสารสอบเทียบเครื่องมือ

ประจำเดือนธันวาคม พ.ศ. 2567

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3541	Jiranatee Associates Co., Ltd.	CL-012-65	31 Oct 22	30 Oct 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	10 Apr 25	-
3	Air Flow Meter	Particular Matter (PM _{2.5})	Mesa Labs	DeltaCal DC1 158850	Innovative Instrument Co., Ltd.	24-AFM-173	28 Aug 24	27 Aug 25	-
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	21 Apr 25	-
5	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H757	10 Apr 24	9 Apr 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C 42C-0508011076	UAE Consultant Co., Ltd.	04102024	4 Oct 24	3 Oct 25	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Fisher Scientific	42C 0517512000	UAE Consultant Co., Ltd.	04102024	4 Oct 24	3 Oct 25	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jun 23	6 Jun 31	-
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920017	UAE Consultant Co., Ltd.	15062024	15 May 24	14 May 25	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920017	UAE Consultant Co., Ltd.	09042024	4 Sep 24	3 Sep 25	-
11	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jun 23	6 Jun 31	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497732	UAE Consultant Co., Ltd.	09092024	9 Sep 24	8 Sep 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497733	UAE Consultant Co.,Ltd.	14062024	14 Jun 24	13 Jun 25	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 GAL13KSE	UAE Consultant Co.,Ltd.	19092024	19 Sep 24	18 Sep 25	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	Thermo Scientific	55i 1182920025	UAE Consultant Co.,Ltd.	01102024	1 Oct 24	30 Oct 25	-
17	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11058	Calibration Laboratory Co.Ltd	Q24037354	8 Apr 24	7 Apr 25	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV36 107224	Innovative Instrument Co.,Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
20	Sound Level Meter	$L_{Aeq} 1\text{ hr}^*$ $L_{Aeq} 24\text{ hrs}^*$ L_{Amax}^* L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007306	Electrical And Electronics Institute Foundation For Industrial Development	CP20240290EA	5 Aug 24	4 Aug 25	-
21	Sound Level Meter	$L_{Aeq} 1\text{ hr}^*$ $L_{Aeq} 24\text{ hrs}^*$ L_{Amax}^* L_{A90} เสียงรบกวน	Larson Davis	LxT1 0007308	Electrical And Electronics Institute Foundation For Industrial Development	CP20240322EA	22 Aug 24	21 Aug 25	-

CERTIFICATE OF CALIBRATION

Certificate No. : CDF-046-67

Page 2 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TSCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 1041
ID NUMBER : UAE.FM.177/2561
CONDITION AS-RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phraekhong,
Bangkok 10260

RECEIVED DATE : 24 Oct 2024
MEASUREMENT DATE : 04 Nov 2024
ISSUE DATE : 05 Nov 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

CALIBRATION CONDITION:
Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.7 °C and 49.7 %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 Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/MC/NO-2p. The W-CL-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognition of the national standards and to realization of the International system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: 0166003-23.

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

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice mmHg	Y	Standard Flow [Qs] m ³ /min
1	0.705	752.889	23.31	22.18	57.330	1.708	1.304	0.652
2	1.001	752.844	23.26	22.53	61.114	1.413	1.844	0.918
3	1.117	752.823	23.14	22.61	61.285	1.413	2.054	1.054
4	1.168	752.781	23.25	22.65	60.983	1.416	2.119	1.119
5	1.412	752.825	23.06	22.48	69.794	1.722	2.741	1.355

Slope (k): 2.04171
Intercept (y): -0.02934
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice mmHg	Y	Standard Flow [Qs] m ³ /min
1	0.705	752.889	23.31	22.18	57.330	1.708	0.620	0.654
2	1.001	752.844	23.26	22.53	61.114	1.413	1.159	0.922
3	1.117	752.823	23.14	22.61	61.285	1.413	1.334	1.058
4	1.168	752.781	23.25	22.65	60.983	1.416	1.416	1.123
5	1.412	752.825	23.06	22.48	69.794	1.722	1.722	1.359

Slope (k): 1.27883
Intercept (y): -0.01823
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration

Calibrated by:
☐ Mr. Sorngat Thacholad
☒ Miss Jiraporn Lertsomphol

Approved signatory:
Mr. Panyaa 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

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เอกสารไม่ควบคุม



United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phraekhong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaiconsultant.com E-mail: uae@uaiconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Sep 6, 2024

Equipment : Gas Analyzer (SO₂) **Model :** 43i
Manufacturer : Thermo SCIENTIFIC **Serial Number :** 1182920016

Standard Gas Concentration

Sulphur Dioxide (SO₂) : 42.89 PPM
Nitric Oxide (NO) : 46.77 PPM
Methane (CH₄) : - PPM
Carbon Monoxide (CO) : 965.9 PPM
Cylinder No. : EB01159156
Expiration Date : Nov 06, 2026

Dilutor Detail

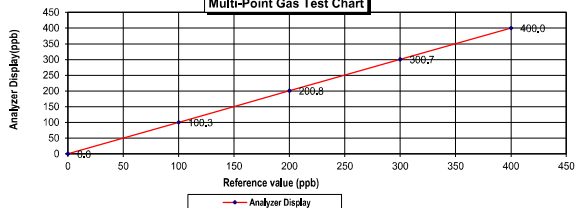
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.3	0.30	0.30	0.30
Level 3	40.00%	200.8	0.80	0.40	0.40
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb
:Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart



6 9 2567 6 Sep 2024

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD:
Part Number: E05NI91E15A0014
Cylinder Number: E80162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Reference Number: 180-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 05, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 800R-12031, using the assay procedures listed. Analytical Metrology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration system. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	$\pm 0.9\%$ NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	$\pm 0.9\%$ NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	$\pm 1.4\%$ NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	$\pm 0.3\%$ NIST Traceable	06/26/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	$\pm 1.2\%$ NIST Traceable	06/27/2023
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Jan 04, 2031
PRM	C2219101	AP1514048	100.19 PPM NITRIC OXIDE/NITROGEN	$\pm 0.3\%$	Feb 28, 2025
GMS	2023042525	CC754381	98.62 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Apr 25, 2031
PRM	12408	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	$\pm 1.5\%$	Feb 17, 2023
GMS	15340020202	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	$\pm 1.6\%$	Sep 29, 2025
NTRM	160102-22	KAL038252	97.69 PPM SULFUR DIOXIDE/NITROGEN	$\pm 0.8\%$	Nov 01, 2027
CO	230601	CC745802	248.47 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.2\%$	Dec 08, 2028
NTRM	130605-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	$\pm 0.6\%$	May 14, 2025

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

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Nicolet iS50 FTR ALP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTR ALP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTR ALP2010245 NO2	FTIR	Jun 15, 2023
Nicolet iS50 FTR ALP2010245 SO2	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

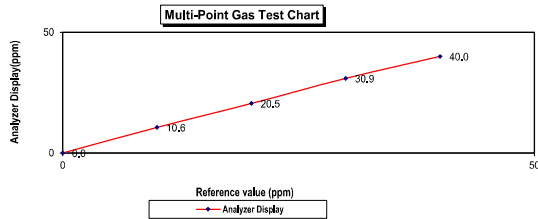
Test Date : Sep 9, 2024

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9	PPM	
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.6	0.6	5.7	5.7
Level 3	40.00%	20.0	20.5	0.5	2.4	2.4
Level 4	60.00%	30.0	30.9	0.9	2.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)		2.20	



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MULTI-POINT GAS TEST REPORT

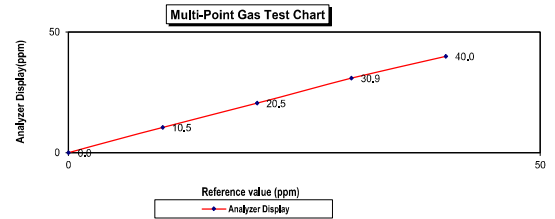
Test Date : June 14, 2024

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9	PPM	
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.5	0.5	4.8	4.8
Level 3	40.00%	20.0	20.5	0.5	2.4	2.4
Level 4	60.00%	30.0	30.9	0.9	2.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		2.02



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Airgas Specialty Gases
Airgas USA LLC
6441 Barton Road
Pittsburgh, PA 15249
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.
Part Number: E05NI91E15A0014
Cylinder Number: E0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Reference Number: 160-40272205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 05, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	194202308	DC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APF1514048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMS	2023042525	DC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMS	153400202002	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.6%	Sep 29, 2025
NTRM	160102-32	KAL039820	97.69 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 08, 2028
NTRM	130606-02	CC4117730	13.359 % CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicolet iS50 FTIR ALP2010245 CO ₂	FTIR	Jun 15, 2023	
SIEMENS ULTRAMATE N1-C8-180	NDIR	Jun 14, 2023	
Nicolet iS50 FTIR ALP2010245 NO	FTIR	Jun 29, 2023	
Nicolet iS50 FTIR ALP2010245 NO ₂	FTIR	Jun 15, 2023	
Nicolet iS50 FTIR ALP2010245 SO ₂	FTIR	Jun 08, 2023	

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Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

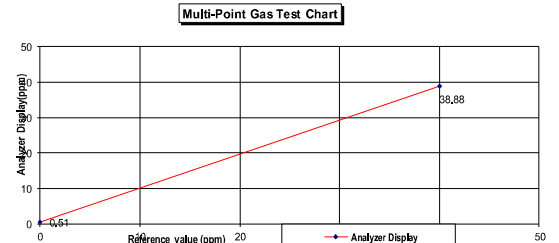
Test Date : Sep 19, 2024

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : GAL13KSE

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH ₄)	39.8	PPM	Serial Number :
Carbon Monoxide (CO)	-	PPM	
Cylinder No. :	D824432		
Expiration Date :	Aug 4, 2028		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	0.51	0.51	0.51	0.51
Level 2	80.00%	40.00	38.88	-1.12	-2.88	2.88
Remark : Measuring Range		50.00 ppm	Average Difference (%)		1.70	
:Acceptable Limit ± 5%						



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เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.295	+0.005	1.9
0.4	50 Hz		0.400	0.394	+0.006	1.6
0.5	50 Hz		0.500	0.493	+0.007	1.6
0.6	50 Hz		0.600	0.593	+0.007	2.5
0.7	50 Hz		0.700	0.692	+0.008	2.5
0.3	100 Hz	peak	0.300	0.296	+0.004	1.9
0.4	100 Hz		0.400	0.395	+0.005	1.6
0.5	100 Hz		0.500	0.494	+0.006	1.6
0.6	100 Hz		0.600	0.594	+0.006	2.5
0.7	100 Hz		0.700	0.693	+0.007	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	2.989	+0.011	1.8
4	50 Hz		4.000	3.981	+0.019	1.8
5	50 Hz		5.000	4.962	+0.038	1.8
6	50 Hz		6.000	5.939	+0.061	1.8
7	50 Hz		7.000	6.924	+0.076	1.8
*3	100 Hz	peak	3.000	2.983	+0.017	1.6
*4	100 Hz		4.000	3.972	+0.028	1.6
*5	100 Hz		5.000	4.956	+0.044	1.6
*6	100 Hz		6.000	5.929	+0.071	1.5
*7	100 Hz		7.000	6.919	+0.081	1.5

Certificate No. Q24037354

F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.059	+0.001	1.8
0.07	50 Hz		0.070	0.069	+0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.059	+0.001	1.8
0.07	100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24037354

F3-011-05/12-23

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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO., LTD.
Address : 81 Soi Udomsuk 41, Sakhumvit Road, Bangchak,
Prakanong, Bangkok 10260Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAE-EFM.171/2564Class : 1
Range : 94, 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EI	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 Luangam
Service Calibration EngineerMr. Pachi Mathavorn
Calibration Engineer Supervisor

Issue Date : 26 June 2024

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Certificate No : 24-ACT-091

Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

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	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	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
114 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 (%)	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.24	-	-	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	-	-	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

เอกสารไม่ควบคุม

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Decision Rule for Statements of Conformity

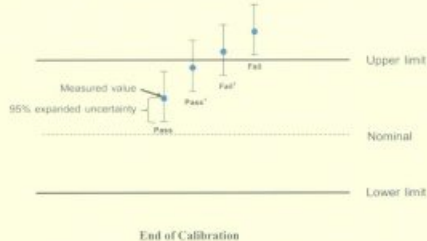
The standard decision rule employed for the statements of conformity to such calibration result will be applied using ILAC-G8:09/2019 Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

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

Pass⁵ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail⁶ - 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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Institute.
เอกสารไม่ควบคุม
FM-708-ACT-02 Rev-03 Issue date 5/10/24

Certificate No.: CP20240290EA
Operation No.: CP2024070253

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)
ID No.: UAE.EFM.039/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1

ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240290EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007306 (Meter), 345235 (Microphone), 077641 (Preamplifier)
ID No.: UAE.EFM.039/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CD20240142EA	12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240290EA

Calibration Report

Function : 2. Self-generated Noise
2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting (dB)	Measured value (dB)
A-weighting	28.7
C-weighting	28.4
Z-weighting	34.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.0	0.0	±1.0
1000	-0.1	-0.1	-0.1	±0.7
8000	-0.4	-0.5	-0.4	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	0.0	+2.5; -16.0

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Certificate No.: CP20240290EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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F-CAL-005 Ed.1

Certificate No.: CP20240290EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0 ; -3.0
LAE	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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F-CAL-005 Ed.1

Certificate No.: CP20240290EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.6	142.6	0.0	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Operation No.: CP2024080293

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)

ID No.: UAE.EFM.040/2566

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260

Received Date: 9 August 2024

Calibrated Date: 22 - 26 August 2024

Issued Date: 28 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

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F-CAL-004 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007308 (Meter), 345238 (Microphone), 077643 (Preamplifier)
ID No.: UAE EFM.040/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
29.4

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	29.0
C-weighting	28.9
Z-weighting	35.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.2	±1.0
1000	0.3	0.3	0.3	±0.7
8000	-0.6	-0.5	-0.5	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.1	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	-0.1	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1

Certificate No.: CP20240322EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.6	-0.4	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.8	-0.2	+1.0; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.8	-0.2	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240322EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.0	142.8	-0.2	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 1.
 4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1



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

Certificate of Calibration

Certificate No.: 24P1252
Page: 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.078/2566

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.

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1011 mbar
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using " DKD-R 6-1 : Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through-
-National Institute of Metrology (Thailand), NSC-ONSC Accredited No, Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannarari
[✓] Attapol Panurach

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Cart.No.: 24P1252
Page: 2 of 2

Result of calibration:- Without adjustment

Range : 0 inH₂O to 36 inH₂O

Function:- Pressure Measurement
Increasing Pressure

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure		UUC Indication		ΔP	Error
High-port side	Low-port side	High-port side	Low-port side		
0.00	0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00	0.00
4.00	2.00	-2.00	4.00	0.00	0.00
6.00	3.00	-3.00	6.00	0.00	0.00
8.00	4.00	-4.00	8.00	0.00	0.00
10.00	5.00	-5.00	10.00	0.00	0.00
12.00	6.00	-6.00	12.00	0.00	0.00
14.00	7.00	-7.05	14.05	0.05	0.05
16.00	8.00	-8.05	16.05	0.05	0.05
18.00	9.00	-9.05	18.05	0.05	0.05
20.00	10.00	-10.10	20.10	0.10	0.10
22.00	11.00	-11.10	22.10	0.10	0.10
24.00	12.00	-12.10	24.10	0.10	0.10
26.00	13.00	-13.10	26.10	0.10	0.10
28.00	14.00	-14.10	28.10	0.10	0.10
30.00	15.00	-15.10	30.10	0.10	0.10
32.00	16.00	-16.10	32.10	0.10	0.10
34.00	17.05	-17.10	34.15	0.15	0.15
35.80	18.00	-18.00	36.00	0.20	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/10 MOI 15, SOI 25, NAKORN 11 TAMBON BANGKAKO
AMPHOE BANG PHU SAMET PRAKAN PROVINCE 10140 THAILAND
TEL : 0800-2116-5900 / FAX : 0800-2116-7140



INNOVATIVE
Calibration Laboratory



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Certificate of Calibration

Customer

Certificate No : 24-AFM-173

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok,
10260

Request No : Req-2024-1833

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 158850
ID : UAE.EFM.036/2561

Accuracy : 0.75% 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 : 15 August 2024
Calibration Date : 28 August 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 High flow	18501012012	Sensidyne	1 August 2025
Temperature meter	GT 11	04000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/051882	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 :

Mr. Noppadon Luangari
Service Calibration Engineer

Mr. Panch Mathavan
Calibration Engineer Supervisor

Issue Date : 28 August 2024

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

F86-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 24-AFM-173
Request No : Req-2024-1833

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)	MPE (l/min)	Result
25.60	99.80	14.50	14.46	-0.04	0.20	0.109	N/A
25.60	99.80	15.00	14.95	-0.05	0.21	0.113	N/A
25.50	99.70	15.80	15.73	-0.07	0.22	0.119	N/A
25.40	99.60	16.67	16.59	-0.08	0.23	0.125	N/A
25.50	99.50	18.30	18.20	-0.10	0.26	0.137	N/A

Note STD = Standard UUC : Unit Under Calibration
= UUC Reference Condition : 25 °C, 101.3 kPa, Air
- 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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Certificate of Calibration

Certificate No : 24-TPM-390
Request No : Req-2024-1833
Page : 1/2

Customer
Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO., LTD.
Address : 81 Soi Udumak 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter Range Calibration : 20 °C to 50 °C
Manufacturer : BGI Type of Sensor : RTD
Model : Delta Cal DC1 Sensor Diameter (mm) : 3
Serial Number : 158850 Calibration Position (mm) : 45
Resolution : 0.1 °C Instrument Status : Used
ID Number : UAE.EFM.038/2561

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 15 August 2024
Calibrated Date : 29 August 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/ RTD100, SN:
08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.:
Calibration 9292

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

Approved By : 
Mr. 
Technical Manager
Issue Date : 29 August 2024

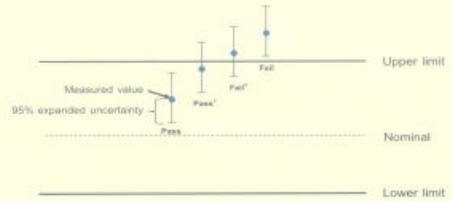
เอกสารไม่ควบคุม

Certificate No : 24-AFM-173
Request No : Req-2024-1833

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.
Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.
Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.
Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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Calibration Note
UUC Adjustment : Not Adjust

Certificate No : 24-TPM-391
Request No : Req-2024-1832
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
T _a	20.031	20.0	0.0	0.13
	25.034	25.1	-0.1	0.13
	30.035	30.1	-0.1	0.13
	35.029	35.1	-0.1	0.13
	40.011	39.9	+0.1	0.13
	45.008	44.8	+0.2	0.13
	50.007	49.8	+0.2	0.13
T _T	20.031	19.9	+0.1	0.13
	25.034	24.9	+0.1	0.13
	30.035	30.0	0.0	0.13
	35.029	35.1	-0.1	0.13
	40.011	40.1	-0.1	0.13
	45.008	45.2	-0.2	0.13
	50.007	50.2	-0.2	0.13

End of Certificate

Calibrated By : 
Mr. 

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Certificate of Calibration

Certificate No. : 24P1369
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.013/2547

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

4.Scale and conversion factor is 1 kPa = 7.50062 mmHg

5.This result of calibration instrument was in absolute pressure.

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

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

8.This Certification is traceable to the International System of Unit maintained through-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prabpaijal
[] Sura Suwannasri
[✓] Attapol Panurach

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Result of calibration:- Without adjustment

Range : 720 mmHg to 780 mmHg

Function:- Absolute Pressure Measurement

Scale Interval : 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	718.40	729.71	740.61	751.07	761.97	773.05	786.91
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	1.60	0.29	-0.61	-1.07	-1.97	-3.05	-6.91

Decreasing Pressure

Applied Pressure (mmHg)	786.91	772.99	761.71	750.69	740.13	729.35	718.44
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-6.91	-2.99	-1.71	-0.69	-0.13	0.65	1.56

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No. : 24H757
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.132/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

2.The 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 maintained through-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :
[✓] Chakrit Waewwanjua
[] Vipom Tantiyawutti
[] Unnophol Harachai

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Result of Calibration:-

Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	41	0.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:-

Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.5	0.468	0.72
29.997	30.0	0.003	0.72
35.010	35.0	-0.010	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

Standard Gas Concentration

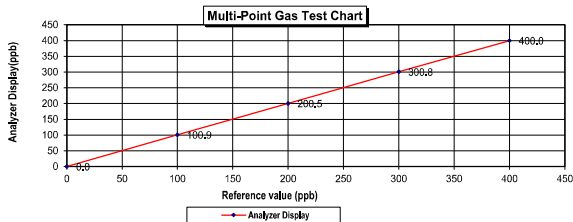
Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 965.9 PPM
Cylinder No. : EB0159156
Expiration Date : Nov 6, 2026

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.8	0.80	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.28
:Acceptable Limit \pm 5%					



MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

Standard Gas Concentration

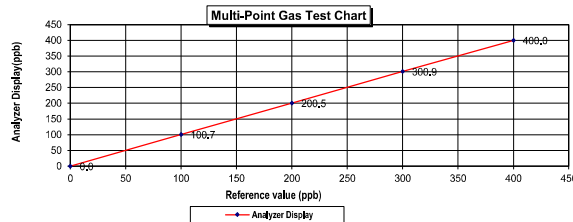
Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 965.9 PPM
Cylinder No. : EB0159156
Expiration Date : Nov 6, 2026

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.25
:Acceptable Limit \pm 5%					



Airgas Specialty Gases
Airgas USA LLC
Sixti Barton Road
Pottersville, PA 16949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD:-
Part Number: E05NI91E15A0014 Reference Number: 160-402772205-1
Cylinder Number: EB0162121 Cylinder Volume: 144.0 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2016 PSIG
PGVP Number: A12023 Valve Outlet: 660
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN Certification Date: Jul 05, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items listed. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	\pm 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	\pm 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	\pm 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	\pm 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	194202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Jan 04, 2031
PRM	C2219101	APF1514048	100.19 PPM NITRIC OXIDE/NITROGEN	\pm 0.3%	Feb 28, 2025
GMS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	\pm 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	\pm 1.5%	Feb 17, 2023
GMS	153400202002	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.6%	Sep 29, 2025
NTRM	160102-32	KAL039320	97.69 PPM SULFUR DIOXIDE/NITROGEN	\pm 0.8%	Nov 01, 2027
CO	230501	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	\pm 0.3%	Dec 08, 2028
NTRM	130806-08	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	\pm 0.6%	May 14, 2025
The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet i550 FTR ALP2101245 CO ₂	FTIR		Jun 15, 2023		
SIEMENS ULTRAMATE N1-C8-180	NDIR		Jun 14, 2023		
Nicolet i550 FTR ALP2101245 NO	FTIR		Jun 29, 2023		
Nicolet i550 FTR ALP2101245 NO ₂	FTIR		Jun 15, 2023		
Nicolet i550 FTR ALP2101245 SO ₂	FTIR		Jun 08, 2023		



MULTI-POINT GAS TEST REPORT

Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration

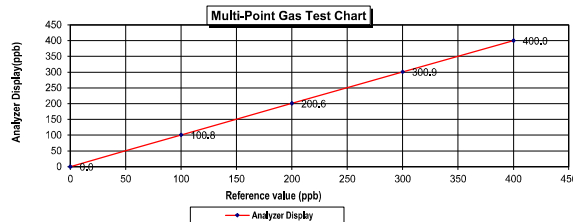
Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 965.9 PPM
Cylinder No. : EB01159156
Expiration Date : Nov 06, 2026

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.8	0.80	0.79
Level 3	40.00%	200.0	200.6	0.60	0.30
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.28
:Acceptable Limit \pm 5%					



List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25
5	Incubator	TOTAL COLIFORM BACTERIA	Binder	KB400 / 20220000000391	Technology Promotion Association (Thailand-Japan)	24TM884	7 Jun 24	6 Jun 25
6	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	9810	8 Feb 24	7 Feb 25
7	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	9807	8 Feb 24	7 Feb 25
8	pH Meter	pH	Horiba	LAQUA-PH210 / HA9M0046	technology promotion association (thailand-japan)	24CH1596	26 Dec 24	24 Dec 25

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khitt Ruttanaprapachai
Approved by :
() Porpan Palpim
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used : Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Cert.No.: 24MM292
Page: 2 of 3

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15864	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certificate is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

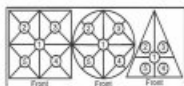
1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading

Position 1	Position 2	Position 3	Position 4	Position 5	
(g)	(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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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เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร
ศูนย์บริการทดสอบวิชาการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuantit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

FCS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.01Q/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505367572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	Q624-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

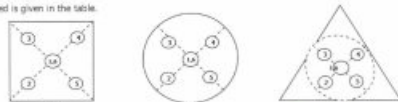
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

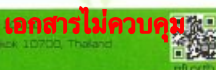
The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

2006 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2006 Soi 36, Aun Amarn Road, Bang Yikhen Subdistr., Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8568 Fax: +66(0) 2422 8545



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.01Q/2565

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000086	2.00
0.001	0.001002	0.001001	-0.000001	0.0000089	2.00
0.005	0.005002	0.005000	-0.000002	0.0000092	2.00
0.01	0.010003	0.010000	-0.000003	0.0000089	2.00
0.05	0.049996	0.050000	0.000004	0.0000096	2.00
0.1	0.100011	0.100000	-0.000011	0.000011	2.00
0.5	0.500016	0.500001	-0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000002	-0.000015	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000031	20.000000	-0.000031	0.000037	2.00
30	30.000040	30.000001	-0.000039	0.000050	2.00
50	50.000028	50.000002	-0.000026	0.000068	2.00
80	80.000068	80.000002	-0.000066	0.000111	2.00

F-CS-012 Revision: 01 Date: 20-04-65

2006 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2006 Soi 36, Aun Amarn Road, Bang Yikhen Subdistr., Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8568 Fax: +66(0) 2422 8545



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.01Q/2565

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
90	90.00010	90.00001	-0.00009	0.00015	2.00
100	100.00006	100.00001	-0.00005	0.00015	2.00
110	110.00007	110.00001	-0.00006	0.00016	2.00
120	120.00009	120.00000	-0.00009	0.00017	2.00
130	130.00010	130.00000	-0.00010	0.00019	2.00
140	140.00014	140.00000	-0.00014	0.00020	2.00
150	150.00009	150.00001	-0.00008	0.00020	2.00
160	160.00010	160.00001	-0.00009	0.00022	2.00
170	170.00012	170.00001	-0.00011	0.00023	2.00
200	200.00016	200.00002	-0.00014	0.00028	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 %.

F-CS-012 Revision: 01 Date: 20-04-65

2006 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2006 Soi 36, Aun Amarn Road, Bang Yikhen Subdistr., Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8568 Fax: +66(0) 2422 8545

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 01 Date: 20-04-65

2006 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2006 Soi 36, Aun Amarn Road, Bang Yikhen Subdistr., Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8568 Fax: +66(0) 2422 8545

Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C09071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.00001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567372	TCS	MC2040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C09071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.00001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unload	0.000050	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.003	0.003003	0.00300	0.00000	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000068	2.00
80	80.000068	80.00005	0.00002	0.00011	2.00

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C09071872

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.00001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
90	90.00000	90.00000	0.00000	0.000015	2.00
100	100.00000	100.00000	0.00000	0.000015	2.00
110	110.00000	110.00000	0.00000	0.000017	2.00
120	120.00000	120.00000	0.00000	0.000018	2.00
130	130.00000	130.00000	0.00000	0.000019	2.00
140	140.00000	140.00000	0.00000	0.000020	2.00
150	150.00000	150.00000	0.00000	0.000020	2.00
160	160.00000	160.00000	0.00000	0.000022	2.00
170	170.00000	170.00000	0.00000	0.000023	2.00
200	200.00000	200.00000	0.00000	0.000028	2.00

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65



เอกสารไม่ควบคุม



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

Cert.No.: 24TW39

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter

Manufacturer : YSI

Model : 5100

Serial No. : 11B 101863

ID No. : UAE.WAO.004/2554

Received Date : 20 February 2024

Test Date : 21 February 2024

Reference : 2402-0629DSC-1

Submitted by :

United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

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 Sirithan

Approved by :

Approved Signatory

() Pornthippa Tameyakul

() Unnopphol Harachai

() Saitthip Meangmai

Issue Date :

22 February 2024

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Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM884
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400
Serial No. : 2022000000391
ID No. : UAE.MIC.029/2565
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 07 June 2024
Calibration Date : 07 June 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama
Approved by : [Signature]
() Ponpan Palpin
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 11 June 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.

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2406-01900C-2
Procedure Used :-

Cert. No.: 24TM884
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	MY49001451	24LM44	TPA	17 Mar 2025

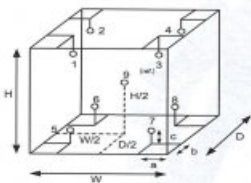
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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)	21	19
RELHumid. (%)	77	75
AC Supply (Volt)	228	229

Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	24-19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9



Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.65 m
H = 1.2 m
Capacity = 0.39 m³

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2406-01900C-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM884
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
35.0	35.0	35.0	0.028	0.28	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.317	35.184	35.142	35.064	35.096	35.093	34.894	34.826	35.056	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

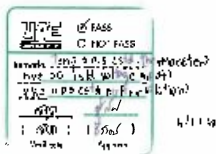
Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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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Cert.No.: 24CH1586
Page: 2 of 3

Condition of this calibration result

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	540501849	130K0118	24E2759	26 Aug 2025
2) Ref. Standard Thermometer	4882054	110K0044	24737	14 July 2025

- This Certificate is traceable to SI through Technology Promotion Association (Thailand) - Japan

2. Certified Reference Materials: The measurement results are traceable to SI through NIST Standard Reference Materials, NIST SRM 910a, NIST SRM 910b, NIST SRM 910c, NIST SRM 910d, NIST SRM 910e, NIST SRM 910f, NIST SRM 910g, NIST SRM 910h, NIST SRM 910i, NIST SRM 910j, NIST SRM 910k, NIST SRM 910l, NIST SRM 910m, NIST SRM 910n, NIST SRM 910o, NIST SRM 910p, NIST SRM 910q, NIST SRM 910r, NIST SRM 910s, NIST SRM 910t, NIST SRM 910u, NIST SRM 910v, NIST SRM 910w, NIST SRM 910x, NIST SRM 910y, NIST SRM 910z, NIST SRM 910aa, NIST SRM 910ab, NIST SRM 910ac, NIST SRM 910ad, NIST SRM 910ae, NIST SRM 910af, NIST SRM 910ag, NIST SRM 910ah, NIST SRM 910ai, NIST SRM 910aj, NIST SRM 910ak, NIST SRM 910al, NIST SRM 910am, NIST SRM 910an, NIST SRM 910ao, NIST SRM 910ap, NIST SRM 910aq, NIST SRM 910ar, NIST SRM 910as, NIST SRM 910at, NIST SRM 910au, NIST SRM 910av, NIST SRM 910aw, NIST SRM 910ax, NIST SRM 910ay, NIST SRM 910az, NIST SRM 910ba, NIST SRM 910bb, NIST SRM 910bc, NIST SRM 910bd, NIST SRM 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910zf, NIST SRM 910zg, NIST SRM 910zh, NIST SRM 910zi, NIST SRM 910zj, NIST SRM 910zk, NIST SRM 910zl, NIST SRM 910zm, NIST SRM 910zn, NIST SRM 910zo, NIST SRM 910zp, NIST SRM 910zq, NIST SRM 910zr, NIST SRM 910zs, NIST SRM 910zt, NIST SRM 910zu, NIST SRM 910zv, NIST SRM 910zw, NIST SRM 910zx, NIST SRM 910zy, NIST SRM 910zz

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	C-A chem	1031205	27 Sep 2025
pH 7.000	Hoch Lange GmbH	C03185	09 July 2025
pH 10.010	C-A chem	1034206	27 Sep 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)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Meter S/N: H4870048	4.00	177.18	177.8	4.01	0.058	2.00
	7.00	0.00	0.2	7.00	0.038	2.00
	7.00	0.00	0.2	7.00	0.038	2.00
	10.00	-177.48	177.1	10.01	0.058	2.00

Cert.No.: 24CH1586
Page: 3 of 3

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (pH)	Coverage factor k
pH Electrode S/N: -	4.008	4.01	184.8	0.0071	2.00
	7.000	6.98	9.1	0.0060	2.00
	7.000	7.00	8.1	0.0060	2.00
	10.010	10.01	-164.5	0.0011	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: -
- Serial No.: -
- Dimension of probe:
- Length: 112 mm
- Diameter: 16 mm
- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.001	15.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
45.0	45.004	45.0	-0.004	0.15	2.00

Remark: - UUC = Unit Under Calibration

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

ภาคผนวก จ

หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
26	Formaldehyde	Distillation, Colorimetric Method ^[2]
27	Free Chlorine	1) Iodometric Method ^[3] 2) DPD Ferrous Titrimetric Method ^[3]
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
30	Hexavalent Chromium	1) Colorimetric Method ^[3] 2) Extraction, Direct Air-Acetylene Flame Method ^[3]
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[3]
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
36	Oil & Grease	1) Soxhlet Extraction-Gravimetric Method ^[3] 2) Soxhlet Extraction Method ^[3]
37	pH	Electrometric Method ^[3]

ลำดับ	สารเคมี	วิธีวิเคราะห์
38	Phenols	1) Distillation, Chloroform Extraction Method ^[3] 2) Distillation, Direct Photometric Method ^[3]
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
40	Sulfide	1) Iodometric Method ^[3] 2) Methylene Blue Method ^[3]
41	Temperature	Laboratory and Field Methods ^[3]
42	Total Dissolved Solids	Dried at 180 °C ^[3]
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ^[3]
44	Total Suspended Solids	Dried from 103 to 105 °C ^[3]
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[3] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[3]
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]

นำได้เกิน จำนวน 126 รายการ

ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]

5 Antimony...

ลำดับ	สารเคมี	วิธีวิเคราะห์
5	Antimony	Digestion, Inductively Coupled Plasma Method ^[3]
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^[3]
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]

19 Bromodichloromethane...

ลำดับ	สารเคมี	วิธีวิเคราะห์
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]

34 Chromium (III)...

ลำดับ	สารเคมี	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[3] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[3]
35	Chromium (VI)	1) Colorimetric Method ^[3] 2) Extraction, Air-Acetylene Flame Method ^[3]
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
37	Cyanide	Distillation, Colorimetric Method ^[3]
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ^[3]
39	DDO	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[3]
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[3]

48 1,1-Dichloroethane...

ลำดับ	สารเคมี	วิธีวิเคราะห์
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
63	Di n Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]

65 Endrin...

ลำดับ	สารเคมี	วิธีวิเคราะห์
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
66	Ethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
73	n-Hexane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
74	α-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
75	β-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]

76 γ-HCH...

ลำดับ	สารเคมี	วิธีวิเคราะห์
76	γ-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[3]
84	Methanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[3]
86	Methyl bromide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
87	Methylene chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]

91 Naphthalene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
98	pH	Electrometric Method ^[3]
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
100	Phenol	1) Distillation, Chloroform Extraction Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]

102 Selenium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
103	Silver	Digestion, Inductively Coupled Plasma Method ^[3]
104	Styrene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
107	Toluene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
108	Iovaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[3] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
109	TPH (C ₅ - C ₉)	1) Purge and Trap, Gas Chromatographic Method ^[3],20] 2) Purge and Trap, Gas Chromatographic/ Mass spectrometric Method ^[3],21]
110	TPH (C ₁₀ - C ₁₉)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[7,28]
111	TPH (C ₂₀ - C ₃₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[7,28]
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
115	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[3]
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]

119 Vanadium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
119	Vanadium	Digestion, Inductively Coupled Plasma Method ^[3]
120	Vinyl acetate	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
121	Vinyl chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
122	m-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
123	o-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
124	p-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
125	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[3]
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[3] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 3) Digestion, Inductively Coupled Plasma Method ^[3]

สิ่งปลูกสร้างหรือวัตถุที่มีใช้แล้ว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
2	Antimony	Digestion, Inductively Coupled Plasma Method ^[3,12]
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3,14] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3,14] 4) Digestion, Inductively Coupled Plasma Method ^[3,12]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 2) Digestion, Inductively Coupled Plasma Method ^[3,12]

5 Beryllium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 2) Digestion, Inductively Coupled Plasma Method ^[3,12]
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 4) Digestion, Inductively Coupled Plasma Method ^[3,12]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 4) Digestion, Inductively Coupled Plasma Method ^[3,12]
9	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^[3,13,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^[3,12,15] 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[3,13,15] 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[3,12,15]
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method; Calculation ^[3,13,15] 2) Alkaline Digestion, Colorimetric Method ^[3,15]
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 2) Digestion, Inductively Coupled Plasma Method ^[3,12]

12 Copper...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,12] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[3,13] 4) Digestion, Inductively Coupled Plasma Method ^[3,12]
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,7,21] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[8,21]

20 Lead...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(5,13) 4) Digestion, Inductively Coupled Plasma Method ^(5,12)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,7,21) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(8,21)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1,4,1) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1,7) 4) Digestion, Inductively Coupled Plasma Method ^(5,12) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1,8)
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,7,21) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(8,21)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 2) Digestion, Inductively Coupled Plasma Method ^(5,12)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(1,4,12) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(5,13) 4) Digestion, Inductively Coupled Plasma Method ^(5,12)

26 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',3,4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,7,21) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(8,21)

27 Pentachlorophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,7,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(8,26) Electrometric Method ^(25,26)
28	pH	Electrometric Method ^(25,26)
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(5,13) 4) Digestion, Inductively Coupled Plasma Method ^(5,12)
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 2) Digestion, Inductively Coupled Plasma Method ^(5,12)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 2) Digestion, Inductively Coupled Plasma Method ^(5,12)
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,7,21) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(8,21)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,10,23) 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(1,8,23) 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,12,23) 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(8,23)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 2) Digestion, Inductively Coupled Plasma Method ^(5,12)

35 Zinc...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(1,4,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,12) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(5,13) 4) Digestion, Inductively Coupled Plasma Method ^(5,12)

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กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลเชิงปฏิบัติกร ก่อตั้งโดยมูลนิธิเพื่อสิ่งแวดล้อม กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๕๓๐ ๖๓๓๒ ต่อ ๒๑๐๔-๕



ที่ กอ ๐๓๑๐(๑)/ ๑๖ ๙ ๑ ๘

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๓ ธันวาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอรับทราบผลของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ พฤศจิกายน ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๓ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ได้แก่

- | | |
|-------------------------------|----------------------------|
| ๑) นางสาวพรพิมล ประชาพันธุ์ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๑ |
| ๒) นายวัชรินทร์ บุญญาธิ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๒ |
| ๓) นางสาวณัฐชา แก้วภาพ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๓ |
| ๔) นายนิพนธ์ สุจริ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๔ |
| ๕) นายสิทธิพล พร้อมทองชั้นบุญ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๕ |
| ๖) นางสาวณัฏฐพร การงานดี | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๖ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์ กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม ดำรงทอง)
ผู้อำนวยการกองวิจัยและพัฒนาการวิเคราะห์และประเมินผลเชิงปฏิบัติกร
มูลนิธิสถาบันมาตรฐานวิธีกรวิเคราะห์และประเมินผลเชิงปฏิบัติกร



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กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลเชิงปฏิบัติกร
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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ กอ ๐๓๑๐(๑)/ ๘ ๗ ๒ ๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๕ พฤษภาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอรับทราบผลของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๖ พฤษภาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๓ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- | | |
|-----------------------------------|----------------------------|
| ๑) นางสาวศุภิศา เจริญชัยสมบัติ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๐ |
| ๒) นายสงกรานต์ มานิตย์ทอง | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๑ |
| ๓) นางสาวอรอนงค์ คุณานุพันธ์ชัย | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๒ |
| ๔) นางสาวอรอนงค์ ลาภม | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๓ |
| ๕) นางสาวสุภาวรินทร์ จันทร์ประทีป | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๔ |

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔ ราย

- | | |
|--------------------------|----------------------------|
| ๑) นางสาววิภา ฝ้ายสิงห์ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๕ |
| ๒) นางสาวณัฏฐพร สุจริ | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๖ |
| ๓) นางสาวณัฏฐพร รอดทอง | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๗ |
| ๔) นางสาวณัฏฐพร แสงสว่าง | ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๕๘ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์ กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม ดำรงทอง)
ผู้อำนวยการกองวิจัยและพัฒนาการวิเคราะห์และประเมินผลเชิงปฏิบัติกร
มูลนิธิสถาบันมาตรฐานวิธีกรวิเคราะห์และประเมินผลเชิงปฏิบัติกร



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กองวิจัยและพัฒนาการวิเคราะห์และประเมินผลเชิงปฏิบัติกร
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โทรสาร ๐ ๒๕๓๐ ๖๓๓๒ ต่อ ๒๑๐๔-๕
ไปรษณีย์อิเล็กทรอนิกส์ saraband@diw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"





ที่ อก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘

กรมโรงงานอุตสาหกรรม
ถนนพหลโยธิน
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๒ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอรับทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษขอทำปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ มกราคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่ยังถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
ขอปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕๕ สถานที่ตั้งเลขที่ ๓ ซอยสุขุมสุข ๔๔ ถนนสุขุมวิท
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์
ตรวจสอบเรียบร้อยแล้ว ดังนี้

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้อยู่แก่เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

๑) นายวิญญู สุวรรณราช ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๐๑๖

๒) นายพิพัฒน์ ดันอนกุล ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๐๕๗

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๑ ราย

๑) นางสาวอรุณา ประสานศรี ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๒

๒) นายศุภผล เนียมเนียม ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๓

๓) นายศุภกร สรวงศรี ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๔

๔) นายศุภผล ศิลาพันธ์ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๕

๕) นายโชคชัย พุ่มไสยา ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๖

๖) นายณัฐชัย กลับบ้านเกาะ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๗

๗) นายธีรวัฒน์ อรรณวรรณ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๘

๘) นายณัฏฐพงศ์ ชะขุนทด ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๓๙

๙) นางสาวณัฏฐา พงษ์กรกิจ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๔๐

๑๐) นางสาวณัฏฐา พงษ์กรกิจ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๔๑

๑๑) นางสาวพรธิศา จรุงเกียรติยศ ทะเบียนเลขที่ ๖-๑๔๕๕-๖-๐๑๔๒

๓. ให้เพิ่มรอบชำระสารมลพิษที่วิเคราะห์ในดิน ตามสิ่งที่ส่งมาด้วย



ดำเนินการถูกต้อง

อนึ่ง...

หนังสือแนบท้ายทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากรและสารมลพิษขอทำปฏิบัติการวิเคราะห์เอกชน
ที่ อก ๐๓๑๐(๑)/๑๔๕๕๕ ลงวันที่ ๕ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ทันวันพุธที่กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบมาด้วย

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประจักษ์ คำวงศ์)
ผู้อำนวยการส่วนส่งเสริมและสนับสนุน
ปฏิบัติการทางเทคนิคกรมโรงงานอุตสาหกรรม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและพัฒนาสิ่งแวดล้อมพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕ โทรสาร ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๕๕

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.mail.go.th



ดำเนินการถูกต้อง



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวทันโลก ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕๕

ที่ อก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘

ลงวันที่ ๒๒ มีนาคม ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖ รายการ

ดิน จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Benzene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
2	Carbon tetrachloride	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
3	1,2-Dichloroethane	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
4	1,1-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
5	cis-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
6	trans-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
7	Ethylbenzene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
8	Methylene chloride	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
9	Styrene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
10	Tetrachloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
11	Toluene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
12	Trichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
13	m-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
14	o-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
15	p-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)
16	Xylene (Total)	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(1,2)



ดำเนินการถูกต้อง

เอกสารอ้างอิง...

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ กองวิจัยและพัฒนาสิ่งแวดล้อมพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕



ที่ อก ๐๓๑๐(๑)/ ๑๕๕๕.๕.๓

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ ตุลาคม ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิค แอนาไลติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอปิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๘ ตุลาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูนิค แอนาไลติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๕๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๕๑ ถนนสุขุมวิท แขวงบางจาก
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔ ราย

- | | |
|--------------------------------------|----------------------------|
| ๑) นางสาวรามา แก้วก้อนอก | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๐๒ |
| ๒) นายกนกพงศ์ บุญพวง | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๒๙ |
| ๓) นายอรรถพล พงศ์ศุภพร | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๕๕ |
| ๔) นางสาวธัญญลักษณ์ อนุโชติกาญจนนารถ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๐๙ |

๒. ให้เพิ่มผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

- | | |
|--------------------------|----------------------------|
| ๑) นายกนกพงศ์ บุญพวง | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๕๑ |
| ๒) นางสาวรามา แก้วก้อนอก | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๕๒ |

๓. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๒ ราย

- | | |
|----------------------------|----------------------------|
| ๑) นายชินวัฒน์ หอยสิงห์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๐ |
| ๒) นายประพันธ์ แก้วภาคำ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๑ |
| ๓) นายกิตติศักดิ์ มุสิกกุล | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๒ |
| ๔) นายภูวนานท์ ฤทธาคนานนท์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๓ |
| ๕) นายชาญณรงค์ ยี่ล่อ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๔ |
| ๖) นางสาวจิตรมาส ศรีวรรณ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๕ |
| ๗) นายสุจิต โปชันเงิน | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๖ |
| ๘) นายเจษฎา ชวรงค์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๗ |
| ๙) นายรัชต เหมะสุลิน | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๘ |
| ๑๐) นายสุวิทย์ ชุมเอื้อ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๒๙ |
| ๑๑) นายสุวิทย์ หล้าโท | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๓๐ |
| ๑๒) นายชัย บัวสด | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๓๑ |



ดำเนินการโดย
UAE UPPAN ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED

อนึ่ง หนังสือฉบับนี้...

อนึ่ง หนังสือฉบับนี้จะมีผลใช้บังคับเมื่อพ้นกำหนดสิบวันนับแต่วันพ้นจากตำแหน่งของ
ที่ อก ๐๓๑๐(๑)/๑๕๕๕.๕.๓ ลงวันที่ ๕ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม คำทรงพจน์)

ผู้อำนวยการอาวุโสและผู้อำนวยการฝ่ายโรงงาน
ปฏิบัติการและเทคนิคกรมโรงงานอุตสาหกรรม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๕๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๕๐๓

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



ดำเนินการโดย
UAE UPPAN ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED



"อุตสาหกรรมก้าวไกล ประเด็นไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๖๑๕.๕.๓

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๑ กันยายน ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิค แอนาไลติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอปิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๖ สิงหาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูนิค แอนาไลติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๕๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๕๑ ถนนสุขุมวิท แขวงบางจาก
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๘ ราย

- | | |
|----------------------------------|----------------------------|
| ๑) นายบริดา ไชยมณีกุล | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๓๓ |
| ๒) นายปิยะธิดา ศรีโรจน์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๓๕ |
| ๓) นายธีรเมธ สุขศรี | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๔๑ |
| ๔) นางสาวจิรพรรณ ขอนพา | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๕๐ |
| ๕) นายศักดิ์สิทธิ์ เกียรติ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๖๓ |
| ๖) นางสาวลัดดาวัลย์ โพธิ์พันธ์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๘๐ |
| ๗) นางสาวกมลวรรณ เจริญทรัพย์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๘๑ |
| ๘) นางสาวจันทร์จิรา ประกอบทรัพย์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๐๘๘ |

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๑ ราย

- | | |
|------------------------------|----------------------------|
| ๑) นางสาวนิตยา แหวงในเมือง | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๐๔ |
| ๒) นางสาวกมลวรรณ สิมมา | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๐ |
| ๓) นายบัณฑิต วงศ์คำ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๑ |
| ๔) นายประพันธ์ ฌ็อง | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๒ |
| ๕) นางสาวกมลวิภา ลำชี | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๓ |
| ๖) นางสาวนภาพร ชื่นนาคู | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๔ |
| ๗) นางสาวเบญญา มอญคุณ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๕ |
| ๘) นายอมรพล อมรสิทธิ์ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๖ |
| ๙) นางสาวศิริเพชร ทองขาว | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๗ |
| ๑๐) นางสาวนิชากร สุภชาติเกตุ | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๘ |
| ๑๑) นางสาววิมลวรรณ คำตัน | ทะเบียนเลขที่ ๖-๕๕๕-๖-๐๑๑๙ |



ดำเนินการโดย
UAE UPPAN ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED

อนึ่ง หนังสือฉบับนี้...

อนึ่ง หนังสือฉบับนี้จะมีผลใช้บังคับเมื่อพ้นกำหนดสิบวันนับแต่วันพ้นจากตำแหน่งของ
ที่ อก ๐๓๑๐(๑)/๑๕๕๕.๕.๓ ลงวันที่ ๕ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม คำทรงพจน์)

ผู้อำนวยการอาวุโสและผู้อำนวยการฝ่ายโรงงาน
ปฏิบัติการและเทคนิคกรมโรงงานอุตสาหกรรม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๕๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๕๐๓

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



ดำเนินการโดย
UAE UPPAN ANALYST AND ENGINEERING
CONSULTANT COMPANY LIMITED



"อุตสาหกรรมก้าวไกล ประเด็นไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๔๘๘ ๘



กรมโรงงานอุตสาหกรรม
ถนนพหลโยธินที่ ๒ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๑ เมษายน ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอรับทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอขึ้นสถานะพนักงานของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ มีนาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ยื่นขอ ๓ ซอยสุขุมวิท แขวงบางจาก
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

1. ให้ยกเลิกผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย
 - ๑) นางมานิดา แยมโย ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๕
 - ๒) นางสาวกมลวรรณ คงคำ ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๖
๒. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย
 - ๑) นางสาวศิริพร อภิการุณ ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๖
 - ๒) นางสาวพนิดา กลิ่นพูน ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๘
๓. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย
 - ๑) นางสาวอัญชลิตา วัฒนโชติการุณ ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๗
 - ๒) นางสาวจันทร์จิรา ประกอบทรัพย์ ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๘

อนึ่ง หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๒ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบมาเพื่อสืบ

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ผู้ว่าราชการจังหวัดและอธิบดีกรมโรงงาน
อุตสาหกรรมและอธิบดีกรมการช่างอุตสาหกรรม

ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและพัฒนาระบบราชการ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนผู้ประกอบการ

โทร. ๐ ๒๕๓๐ ๖๓๖๒ ต่อ ๒๐๓๓-๕ โทรสาร ๐๒๕๓๐-๖๓๖๒ ต่อ ๒๐๓๓-๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dwf.go.th

ดำเนินการโดย



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ที่ อก ๐๓๑๐(๑)/ ๔๘๘ ๘

กรมโรงงานอุตสาหกรรม
ถนนพหลโยธินที่ ๒ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๕ กุมภาพันธ์ ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอรับทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอขึ้นสถานะพนักงานของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๗ ธันวาคม ๒๕๖๔

- สิ่งที่ส่งมาด้วย
๑. รายชื่อผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย
 ๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย
 ๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด
ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ยื่นขอ ๓
ซอยสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง
คอนซัลแตนท์ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
- ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย ตามสิ่งที่ส่งมาด้วย ๒
- ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล
หรือวัสดุที่ไม่ใช่แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๒ กุมภาพันธ์ ๒๕๖๕ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบ
มาเพื่อสืบ

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ผู้ว่าราชการจังหวัดและอธิบดีกรมโรงงาน
อุตสาหกรรมและอธิบดีกรมการช่างอุตสาหกรรม

ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและพัฒนาระบบราชการ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนผู้ประกอบการ

โทร. ๐ ๒๕๓๐ ๖๓๖๒ ต่อ ๒๐๓๓-๕ โทรสาร ๐๒๕๓๐-๖๓๖๒ ต่อ ๒๐๓๓-๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dwf.go.th

ดำเนินการโดย

ดำเนินการโดย

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dwf.go.th

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dwf.go.th

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dwf.go.th

สิ่งที่ส่งมาด้วย ๑

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕

ที่ อก ๐๓๑๐(๑)/ ๔๘๘ ๘

ลงวันที่ ๐๕ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นางสาวกฤษฎาวรรณ ภัทรธีรกุล | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๑ |
| ๒) นายบวรศักดิ์ ธีรภักดิ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๒ |
| ๓) นางสาวนันทิดา บุญไชย | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๓ |
| ๔) นางปิยะพัชร สุทธิธรรมนัง | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๔ |
| ๕) นางมานิดา แยมโย | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๕ |
| ๖) นางสาวเบญจวรรณ วีระโชติ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๖ |
| ๗) นายพรพจน์ วงศ์อนุรักษชัย | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๗ |
| ๘) นางสาวฉวีวรรณ บุญตา | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๘ |
| ๙) นายสุวิทย์ จิตตนอก | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๐๙ |
| ๑๐) นางสาวจิตติมา สมบูรณ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๐ |
| ๑๑) นางสาวบุษกร เลิศกาญจนา | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๑ |
| ๑๒) นางสาววิไลลักษณ์ ศรีสุข | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๒ |
| ๑๓) นางสาวปวีณา จรัสโชติพิณ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๓ |
| ๑๔) นายศิลา บรรจงใจรักษ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๔ |
| ๑๕) นายปัทมกร วัฒนโชติ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๕ |
| ๑๖) นายธีรวัฒน์ ชนมิ่ง | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๖ |
| ๑๗) นางสาวศิริพร ศรีประทีป | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๗ |
| ๑๘) นางสาวสาริณี ธีระ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๘ |
| ๑๙) นางสาวพรพรรณ สุวรักษ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๑๙ |
| ๒๐) นายภูษณ ทัศนโชติ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๐ |
| ๒๑) นายณัฐวัฒน์ แสงสวัสดิ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๑ |
| ๒๒) นายเอกพันธ์ ประจักษ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๒ |
| ๒๓) นางสาวนิศากร ศรีสกุลสิทธิ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๓ |
| ๒๔) นางสาวจณจิรา ทรัพย์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๔ |
| ๒๕) นางสาวสุวรรณา คงทอง | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๕ |
| ๒๖) นางสาววรรณ พัดสงฆ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๖ |
| ๒๗) นายวิฑูรย์ ไกแก้ว | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๗ |
| ๒๘) นายวัชรพงษ์ เทพบุตร | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๘ |
| ๒๙) นายอนุศาสน์ สายดี | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๒๙ |
| ๓๐) นายวิทย์ เขียวศรีสกุล | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๐ |
| ๓๑) นางสาวอริยา รังสวัสดิ์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๑ |
| ๓๒) นางสาวกมลวรรณ คงคำ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๒ |
| ๓๓) นายสุวิทย์ อรุณจันทร์ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๓ |
| ๓๔) นางสาวทิพย์ อ่อนคำ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๔ |
| ๓๕) นางสาวพณิพรรณ สมบุญ | ทะเบียนเลขที่ ๖-๑๔๕-๕-๐๐๓๕ |

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ทะเบียนเลขที่ 7-๑๕๕-ก-๐๐๓๖
ทะเบียนเลขที่ 7-๑๕๕-ก-๐๐๓๗
ทะเบียนเลขที่ 7-๑๕๕-ก-๐๐๓๘
ทะเบียนเลขที่ 7-๑๕๕-ก-๐๐๓๙
ทะเบียนเลขที่ 7-๑๕๕-ก-๐๐๔๐



สำนักงานคณะกรรมการอาหารและยา

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๒ ราย

- ๑) นางสุทธินันท์ หันสิงห์
- ๒) นางสาวธรรมา แกร์อ่อนนอก
- ๓) นายพิรุณ ทรัพย์มูล
- ๔) นางสาววิไลลักษณ์ ไกลสง
- ๕) นางสาวชาติ ชูงามจันทร์
- ๖) นางสาวปาริชาติ ทองแก้ว
- ๗) นางสาวกัญญา สมพงษ์
- ๘) นายอรรถพร เทพทอง
- ๙) นางสาวอรวรรณ พุทธิชาติ
- ๑๐) นางสาววรรณิณี สายบุญเรือน
- ๑๑) นายกฤษณะพันธ์ นาคทิพย์
- ๑๒) นางสาวอารามย์ อ่อนคง
- ๑๓) นักศึกษิตติศักดิ์ ทรงจรัส
- ๑๔) นางสาวอุไรกานันท์ บุญคง
- ๑๕) นางสาวพรพินิจ แวนทอง
- ๑๖) นายวิฑูรย์ สุวรรณฉาย
- ๑๗) นายอภิวิชญ์ ช่วงดี
- ๑๘) นายณกรณ์ ปาโมชิต
- ๑๙) นายเทพ ธนะพิพนธ์
- ๒๐) นางสาวกัญจนา โสตา
- ๒๑) นางสาวนันทิ์ สุขี
- ๒๒) นางสาวชนนีย์ อุทัยพันธ์
- ๒๓) นายศิวัชร จงสมบูรณ์ยรี
- ๒๔) นางสาวสุภาวดี อินยาวิชัย
- ๒๕) นายพงศ์พร เสงี่ยมวง
- ๒๖) นายขวัญชัย หันทุ่งดี
- ๒๗) นางสาวพิชชากร คีรีพิศาล
- ๒๘) นางสาวปัทมา เลิศคำจันทร์
- ๒๙) นายกันตพงศ์ บุญวงษ์
- ๓๐) นางสาวพัสสา เจริญชัยสมาน
- ๓๑) นายประพนธ์ จงโอ
- ๓๒) นายพิรพัฒน์ ฤทธิฤดีศิริ
- ๓๓) นายปัทมา ไชยภูมิกุล
- ๓๔) นายพิชชากร เลื่อนผล
- ๓๕) นายพิษณุศักดิ์ ศรีจริง

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ผู้ชำนาญการกองวิจัยและประเมินศักยภาพ
ปฏิกิริยาทางการเกษตรของดินและน้ำในสวนอุตสาหกรรม

๓๖) นายอนภสิทธิ์...

ปฏิวัติการปกครองเมืองเชียงใหม่ 447 แห่ง

[illegible]

๓๗) นายอิทธิพงษ์ ศรีวิเศษ
๓๘) นางสาวกรรณิการ์ ลำธิพา
๓๙) นายสุภกรรณ์ พิธีพร
๔๐) นายพรชัย คู่ม่วง
๔๑) นางสาวทัศนีย์ ไชยหาร
๔๒) นายอิทธิพงษ์ ศรีคำแพง
๔๓) นางสาวณิชา พานศิริ
๔๔) นางสาวสัณติวารี โพธิ์พันธ์
๔๕) นางสาวกรรณวรรณ เฉลิมชัยพร
๔๖) นายพรรัตน์ อัมพาคม
๔๗) นายปวิณ ใหญ่
๔๘) นางสาวพรนัชชา กัมมณ
๔๙) นายณณสิทธิ์ ศรีพิตร
๕๐) นางสาวอริยา ชัยหารสุข
๕๑) นายสงกรานต์ นาลัยทอง
๕๒) นางสาวสาธิตา แซ่เหียว
๕๓) นายศักดิ์สิทธิ์ นุ่มเิน
๕๔) นายวรพงษ์ นนทจันทร์
๕๕) นางสาวสุนงา มาตมวธ
๕๖) นางสาวอนุสรณ์ คุ้มปานธุ์
๕๗) นายวรยุทธ สารภี
๕๘) นางสาวสิริยา วีระพันธ์วิทย์
๕๙) นายอุทกพงษ์ สดกการ
๖๐) นายณัฐชัย พรหมอากัณ
๖๑) นายชินวัตร พานแก้ว
๖๒) นายธีรชาติพล โสภ
๖๓) นายปริทัศน์ แสงงาม
๖๔) นางสาวอนุภรณ์ อภาพ
๖๕) นายอาทิตย์ อุมล
๖๖) นายปรพ บุญนา
๖๗) นายอภิรักษ์ ใจบุญ
๖๘) นายศุภณัฐ พงษ์ธีรภาพ
๖๙) นางสาวสุพารัตน์ อัมพ
๗๐) นายสุภากร งามใจ

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LEAD ANALYST AND ENGINEERING **ดำเนินธุรกิจ**

(นางจันทา เกษะศรีนทวิ)

สำนักงานการกฤษฎีกา
กระทรวงมหาดไทย
กรุงเทพฯ ๑๐๐

Journal of Management Inquiry 20(4) 409-424

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูโรเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕
ที่ กก ๐๓๑๐(๑)/ ๑๘๗๕ ลงวันที่ ๑๔ กุมภาพันธ์ ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๘๗ รายการ

แนบท้าย จำนวน ๕6 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
4	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
5	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
6	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
7	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽⁴⁾ 2) Closed Reflux, Colorimetric Method ⁽⁴⁾ 3) Open Reflux, Titrimetric Method ⁽⁴⁾
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽⁴⁾ 2) Flow Injection Analysis Method ⁽⁴⁾

16 o,p'-DDT...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
27	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) DPD Ferrous Titrimetric Method ⁽⁴⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Hexavalent Chromium	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Direct Air-Acetylene Flame Method ⁽⁴⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

36 Oil & Grease...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

แนบท้าย จำนวน 126 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

4 Anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

30 Chlorodibromomethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Air-Acetylene Flame Method ⁽⁴⁾
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

42 Dibenzo(a,h)anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
42	Dibenzo(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

70 Heptachlor epoxide...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
74	α -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
75	β -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
76	γ -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽²⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

82 Manganese...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽²⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
87	Methylene chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽²⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
103	Silver	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

108 Toxaphene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₅ - C ₉)	1) Purge and Trap, Gas Chromatographic Method ^(11,21) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,25)
110	TPH (C ₁₀ - C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,21)
111	TPH (C ₁₈ - C ₃₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,21)
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

124 p-Xylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

อากาศเสีย (ปล่องระเหย) จำนวน 25 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
4	Carbon Monoxide	Instrumental Analyzer Method ⁽³⁾
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
9	Cresol	Absorption Sampling, Gas Chromatographic Method ⁽³⁾

10 Dioxins/Furans...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
10	Dioxins/Furans	Isokinetic Sampling ⁽⁴⁾
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ⁽³⁾
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽³⁾
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽³⁾
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
18	Opacity	Ringelmann's Method ⁽¹⁾
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ⁽³⁾ 2) Instrumental Analyzer Method ⁽³⁾
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽³⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽³⁾ 2) Instrumental Analyzer Method ⁽³⁾
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽³⁾
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽³⁾
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽³⁾
25	Xylene	1) Absorption Sampling, Gas Chromatographic Method ⁽³⁾ 2) Absorption Sampling, Gas Chromatographic Method ⁽³⁾

สิ่งปลูกสร้าง...

สิ่งปลูกสร้างหรือวัสดุที่ไม่ใช่ตัว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
2	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,13) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13)

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
9	Chromium (III)	3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^(2,4,14,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^(2,4,13,16)
10	Chromium (VI)	3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,4,14,16) 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,4,13,16)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

15 DDE...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(2,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(7,18) 4) Digestion, Inductively Coupled Plasma Method ^(2,13) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
24	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
25	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(2,13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(2,13)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(7,18) 4) Digestion, Inductively Coupled Plasma Method ^(2,13) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾



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- 2,2',4,5,5'...

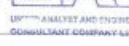
ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	- 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,9,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Electrometric Method ^(31,32)
28	pH	Electrometric Method ^(31,32)
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,23) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,23) 4) Digestion, Inductively Coupled Plasma Method ^(2,6,13)

30 Silver...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(2,13)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(2,13)
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,12,23) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(2,13)
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(2,13)

สืบ จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(10,24)



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3 Aldrin...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(7,13)
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^(7,13)
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

31 Chloroform...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,14,16) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,13,16)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,16)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(28,29,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁷⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

43 Di-n-butyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
54	1,2-Dichloropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

60 2,4-Dinitrophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

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71 Hexachlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,15)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,15)

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83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ^(7,15) 3) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁴⁾
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,15)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

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96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6'-Heptachlorobiphenyl	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

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- 2,2',3,4',5,5',6-...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
97	- 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,22) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,13)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
108	TPH (C ₉ -C ₉)	1) Purge and Trap, Gas Chromatographic Method ^(12,21) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
109	TPH (C ₉ -C ₁₂)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
110	TPH (C ₁₀ -C ₃₃)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

112 1,1,1-Trichloroethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,13)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

เอกสารอ้างอิง

- กรมทรัพยากรธรรมชาติและสิ่งแวดล้อม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณมลพิษในอากาศที่ประชาชนต้องหลีกเลี่ยงจากแหล่งของมลพิษในบริเวณที่ใกล้กับแหล่งชุมชน. 4 ธันวาคม 2549. หน้า 123 ของ 125.
- กรมทรัพยากรธรรมชาติและสิ่งแวดล้อม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2548. เรื่อง วิธีการที่ใช้แล้ว ราชกิจจานุเบกษา. 25 มกราคม 2548. หน้า 123 ของ 125.

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