

ภาคผนวก จ  
เอกสารสอบเทียบเครื่องมือ

ภาคผนวก จ-1

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เอกสารสอบเทียบเครื่องมือ  
เดือนมกราคม พ.ศ. 2568

## 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
<b>Ambient</b>								
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Tisch Environmental, Inc.	TE-5025A / 3541	Jiranatee Associates Co., Ltd.	COF-046-67	5 Nov 24	5 Nov 26
2	U-Tube Manometer		Dwyer	1221-36-W/M / -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	11 Apr 25
3	Air Flow Meter	Particular Matter (PM <sub>2.5</sub> )	BGI	DeltaCal DC1 / 158850	Innovative Instrument Co., Ltd.	24-AFM-173	28 Aug 24	28 Aug 25
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	22 Apr 25
5	Dial Thermo-Hygrometer		Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H757	18 Apr 24	18 Apr 25
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C / 42C-0508011076	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
7	Nitrogen Dioxide Analyzer		Thermo Fisher Scientific	42C / 0517512000	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
8	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	15062024	4 Sep 24	4 Sep 25
10	Sulphur Dioxide Analyzer		Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	09042024	4 Sep 24	4 Sep 25
11	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31

## 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
<b>Ambient</b>								
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i / 1201497732	UAE Consultant Co.,Ltd.	09092024	9 Sep 24	9 Sep 25
13	Carbon Monoxide Analyzer		Thermo	48i / 1201497733	UAE Consultant Co.,Ltd.	14062024	14 Jun 24	14 Jun 25
14	Standard Gases (Mixture)		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	19 Sep 25
16	Total Hydrocarbons Analyzer		Thermo Scientific	55i / 1182920025	UAE Consultant Co.,Ltd.	01102024	1 Oct 24	1 Oct 25
17	Standard Gas		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	10 Apr 24	10 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	26 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	7 Aug 24	7 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	28 Aug 24	28 Aug 25







# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-laboratory.com



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## 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: 2448A13042
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N: 39701R, 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

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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

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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

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INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7-10 MOO 13, SOI SUNTISAKORN 11, TAMBON BANG KAEU,

AMPHOE BANG PHU KAMU, FRAKANG PROVINCE, 10740 THAILAND

TEL : 0608-2110-5800-1 FAX: 060-62110-7140



#### 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-AC-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

Approved By :   
Mr. Pacit 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 laboratory.

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IN-708-ACT-02 Rev.03 Issue date 5/4/24

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 calibration 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 Institute.

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24

Certificate No. : 24-ACT-091

Request No. : Req-2024-1380

Decision Rule for Statements of Conformity

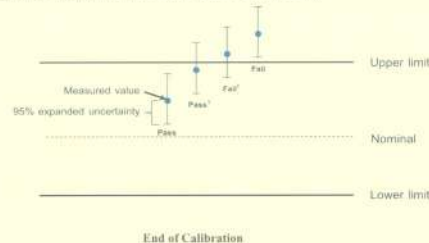
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statement

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

Pass ~ 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



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

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT  
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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), PRMLxT1 (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 Swaksuryiawong )  
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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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), PRMLxT1 (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 system
- 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

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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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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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
	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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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.

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



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

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

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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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เอกสารไม่ควบคุม

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

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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.: 24P1251  
Page : 1 of 2

Equipment : U Tube Manometer  
Manufacturer: Dwyer  
Model : 1221-36-W/M  
Serial No.: -  
ID No.: UAE,EFM,077/2566

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: 1012 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-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 inH<sub>2</sub>O

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  
[✓] Attapol Panurach

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Cert.No.: 24P1251  
Page : 2 of 2

## Result of calibration:- Without adjustment

Function:- Pressure Measurement  
Increasing PressureRange : 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>OScale Interval : 0.1 inH<sub>2</sub>O ( The Second Estimate )

Applied Pressure	High-port side	UUC Indication		ΔP	Error
		Low-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	7.05	-7.05	14.10	0.10	0.10
16.00	8.05	-8.05	16.10	0.10	0.10
18.00	9.05	-9.05	18.10	0.10	0.10
20.00	10.05	-10.05	20.10	0.10	0.10
22.00	11.05	-11.05	22.10	0.10	0.10
24.00	12.05	-12.05	24.10	0.10	0.10
26.00	13.05	-13.05	26.10	0.10	0.10
28.00	14.05	-14.05	28.10	0.10	0.10
30.00	15.05	-15.05	30.10	0.10	0.10
32.00	16.05	-16.10	32.15	0.15	0.15
34.00	17.05	-17.10	34.15	0.15	0.15
36.00	18.00	-18.00	36.00	0.20	0.20

The uncertainty of measurement was ± 0.11 inH<sub>2</sub>O

\* 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

Certificate No : 24-AFM-173

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10269

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	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

Approved By : Mr. Pacit Mathavorn  
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

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	35.88	35.73	-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 :  
$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{meas}}{T_{ref}}$$
  
where : Q = Flow Rate      P = Absolute Pressure      T = Absolute Temperature  
Meas = Measurement Condition      ref = Standard Condition




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

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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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL. : 0669-2116-5960-1 FAX. : 0669-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2881

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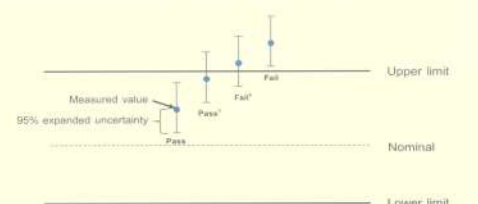
Certificate No : 24-AFM-173

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-G09:2019: Guidelines in 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 = 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.



Upper limit

Nominal

Lower limit

Measured value

95% expanded uncertainty

Pass

Fail



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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL. : 0669-2116-5960-1 FAX. : 0669-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2881

Certificate of Calibration

Customer

Certificate No : 24-TPM-390

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

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 Luangart  
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 NoteCertificate No : 24-TPM-101Request No : Req-2024-1832Page : 2/2

UUC Adjustment : Not Adjust

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. Sittichok Jarapukdeesakul

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

Cal.No.: 24P1369Page: 2 of 2

Result of calibration:- Without adjustmentRange : 720 mmHg to 780 mmHgFunction:- Absolute Pressure MeasurementScale 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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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 CalibrationCertificate No. : 24P1369Page : 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 Pratsapaipal  
[ ] Sura Suwannasari  
[✓] Attapol Panurach

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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 CalibrationCertificate No. : 24H757Page : 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	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), NSG-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.: 24H757  
Page.: 2 of 2

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

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 based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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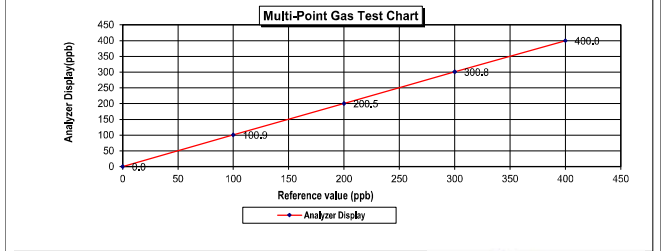
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.28



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4 Oct 2024

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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

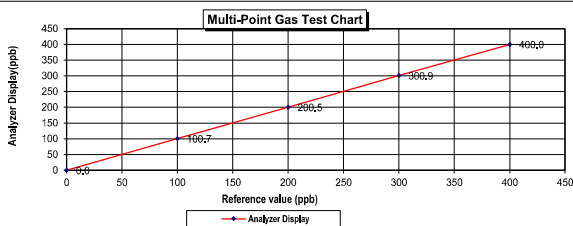
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.25



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4 Oct 2024

### 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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 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	06/29/2023
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	96.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 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	9.893 PPM NITROGEN DIOXIDE/NITROGEN	±1.0%	Sep 29, 2025
NTRM	180102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CC7456002	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025

The GRM, 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 iS50 FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

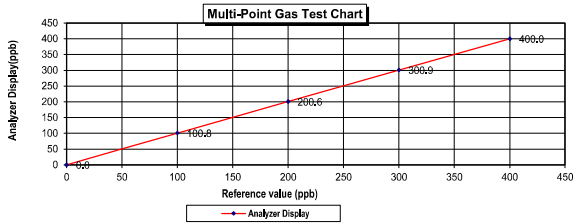
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

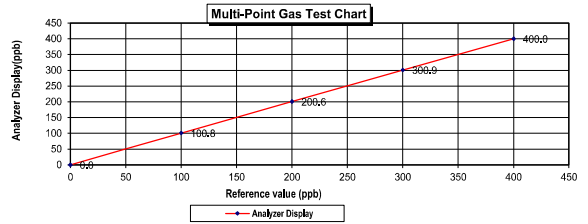
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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Airgas Specialty Gases  
Airgas USA, LLC  
6141 Barton Road  
Pilottsville, VA 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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 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	06/29/2023
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	96.52 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	+/- 1.0%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	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 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATEE N1-D8-180	NDIR	Jun 14, 2023
Nicolet iSSO FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iSSO FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iSSO FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

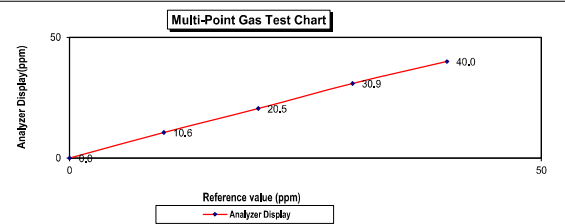
Test Date : Sep 9, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
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
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.5	0.5	2.4
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		Average Difference (%)		2.20
:Acceptable Limit $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

Test Date : June 14, 2024

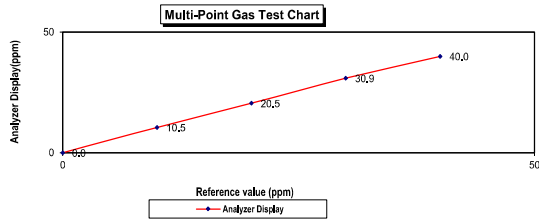
Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9	PPM	
Cylinder No. :	EB0159156		
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
Level 2 20.00%	10.5	0.5	4.8	4.8
Level 3 40.00%	20.5	0.5	2.4	2.4
Level 4 60.00%	30.9	0.9	2.9	2.9
Level 5 80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range 50.0 ppm		Average Difference (%)		2.02

:Acceptable Limit  $\pm 5\%$



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14/June/2024

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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 molar/molar 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	06/29/2023
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	96.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913860	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340202002	E90130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230801	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 PPM 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 iSSO FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iSSO FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iSSO FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iSSO FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

Test Date : Sep 19, 2024

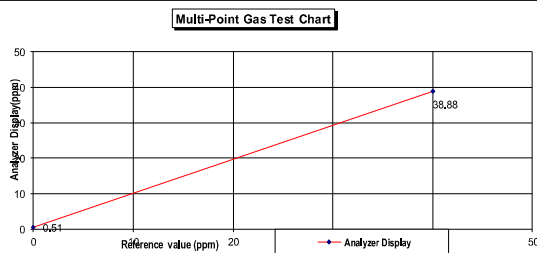
Equipment : Hydrocarbon Analyzer Model : APHA-370  
Manufacturer : HORIBA Serial Number : GAL13KSE

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH <sub>4</sub> )	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	0.51	0.51	0.51	0.51
Level 2 80.00%	38.88	-1.12	-2.88	2.88
Remark : Measuring Range 50.00 ppm		Average Difference (%)		1.70

:Acceptable Limit  $\pm 5\%$



Calculate by

19/9/2567

Approve by

19/Sep/2024

Page 1 of 1

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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 1, 2024

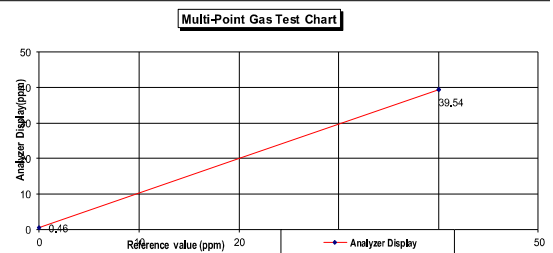
Equipment : Hydrocarbon Analyzer Model : 55i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920025

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH <sub>4</sub> )	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	0.46	0.46	0.46	0.46
Level 2 80.00%	39.54	-0.46	-1.16	1.16
Remark : Measuring Range 50.00 ppm		Average Difference (%)		0.81

:Acceptable Limit  $\pm 5\%$



Calculate by

1/10/2567

Approve by

1/Oct/2024

Page 1 of 1

เอกสารไม่ควบคุม

### 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	Total Dissolved Solids	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	Biochemical Oxygen Demand	ARCO	UC4-1320 / 13URC4S013201	Technology Promotion Association (Thailand-Japan)	24TM303	10 Jan 24	8 Feb 25
5	DO Meter	Biochemical Oxygen Demand	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 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	Horiba	LAQUA-PH210 / HA0C0025	Technology Promotion Association (Thailand-Japan)	24CH319	14 Mar 24	13 Mar 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 Sol 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 :   
( ) Ponpan Paipim  
( ) 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)	15884	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)

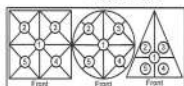
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



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

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



Maximum difference between  
off-center and central loading

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

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



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

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH210  
Serial No. : HA0C0025  
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 Sol Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
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 Lemagatrakul

Approved by :   
Approved Signatory

( ) 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.

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

#### Condition of this calibration result

##### 1. Reference Standard instrument

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

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

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

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

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

#### Calibration Results

##### Function : mV Measurement

Performing standard curve by 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.: 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



Cert.No.: 24CH319  
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.: -	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	0.0095	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.

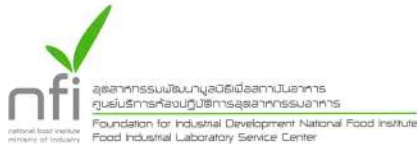
Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ( $\pm$ °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.002	35.0	-0.002	0.13	2.00

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 %.

-o-o-

a 1206342



## Calibration Certificate

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



## Calibration Report

Certificate No.: 2402283-002-01  
Equipment: Electronic Balance  
Model: XSR205DU  
Serial No.: C210685394  
Capacity: 220 g  
Manufacturer: METTLER TOLEDO  
Resolution: 0.00001 g / 0.0001 g  
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5  $\pm$  0.5 °C Relative Humidity: 47.5  $\pm$  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	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 016/23	Quality Reborn	QB24-0343	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:

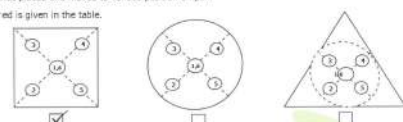
##### 1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
40	0.0000042
80	0.0000052
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

เอกสารไม่ควบคุม

2008 35/35, Anuram Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545

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เอกสารไม่ควบคุม

2008 35/35, Anuram Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545

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## 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: 0.0001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unload	0.000000	0.00000	0.00000	0.0000086	2.00
0.001	0.001003	0.00101	-0.00001	0.0000089	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.049996	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	2.000023	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	20.00000	0.00003	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	80.000068	80.00002	0.00005	0.00011	2.00

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

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10100, Thailand  
Tel: +66(0) 2422 8668 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

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 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

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10100, Thailand  
Tel: +66(0) 2422 8668 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.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 k
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	150.00008	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 %.

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

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10100, Thailand  
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545

## Calibration Report

Certificate No.: 2402283-001-01  
Equipment: Electronic Balance  
Model: XSR205DU  
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	8505567572	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	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:

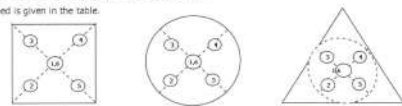
1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
40	0.000052
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.

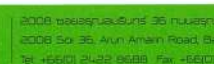
The balance reading obtained is given in the table.



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 ถนนสุขุมวิท 35 แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10100, Thailand  
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545



## Calibration Report

Certificate No.: 2402283-001-01  
Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: XSR205DU  
Resolution: 0.0001 g / 0.0001 g  
Serial No.: C099071872  
ID No.: UAE.WAO.012/2563  
Capacity: 220 g

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
Unload	0.00000	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00499	0.00001	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	10.000008	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

2008 36/36, Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545

ผลการสอบเทียบ



## Calibration Report

Certificate No.: 2402283-001-01  
Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: XSR205DU  
Resolution: 0.0001 g / 0.0001 g  
Serial No.: C099071872  
ID No.: UAE.WAO.012/2563  
Capacity: 220 g

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 k
90	90.00010	90.00000	0.00010	0.00015	2.00
100	100.00006	100.00000	0.00006	0.00015	2.00
110	110.00007	110.00001	0.00006	0.00017	2.00
120	120.00009	120.00000	0.00009	0.00018	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	200.00000	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 36/36, Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545

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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



NSC-TIS-17025  
CALIBRATION 0001

Cert. No.: 24TM303  
Page : 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : Arco  
Model : UC4-1320  
Serial No. : 13URC4S013201  
ID No. : UAE.WAO.015/2561  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udornsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Lab Floor 2  
Received Order : 10 February 2024  
Calibration Date : 10 February 2024  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %  
Calibrated by : Tawatchai Pama  
Approved by :  
( ) Pornthippa Tameyakul  
(x) Unnopphol Harachai  
( ) Suwit Imjai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2402-0234OC-1  
Result of Calibration : ( ° ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 24TM303  
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.1	19.9	0.37	0.72	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.873	19.803	20.322	19.690	19.615	19.585	19.612	19.558	19.645	0.58

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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Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2402-0234OC-1  
Procedure Used :-

Cert. No.: 24TM303  
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	MY59003411	23LM208	TPA	27 Dec 2024

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

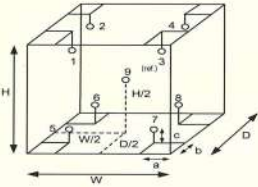
3. This certification is traceable to the International System of Unit.

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 :

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

#### Dimension of Chamber :

D = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	31
REL.Humid. ( % )	70	65
AC Supply ( Volt )	233	234

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9



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, Bangchak, 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 Signatory

( ) Pornthippa Tameyakul  
( ) Unnopphol Harachai  
(✓) Salthip 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.: 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 : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

( ) 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  
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.

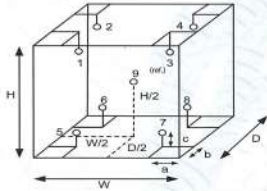
3. This certification is traceable to the International System of Unit.

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

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 m<sup>3</sup>



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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# FOSS

## Customer Service Report

Date: 9 Feb 2024  
Customer: UAE  
Instrument: K7200

FOSS South East Asia  
3388 Sirinrat 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	09:30	16:30
Finish	09:30	17:00	16:30

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: FOSSCARE If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM K7200	
- ตรวจเช็คแบตเตอรี่ PM	
- ตรวจสอบแรงดัน 3 pin 100 mV	
- Alkaline 30 mV - 20 mV	
- วัดแรงดัน PM kit	
- ตรวจสอบอุณหภูมิ	
# ตรวจสอบ SOPH Model - ตรวจสอบความถี่สัญญาณ	
10000725 Serial No. complete 1 PC	

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

Part No:	Batch	Description	Qty
10009965	14.12.2020	FOSS PM kit K7200 1 set of 1 unit	1

I confirm this report is accurate and complete  
Signed FOSS: [Signature] Signed Customer: [Signature]  
Name: [Name] 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  
Customer: UAE  
Instrument: K7200

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	Travel To Customer	Labour	Travel From Customer
Start	08:00	09:30	16:00
Finish	09:30	17:00	16:00

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: FOSSCARE If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM K7200	
- ตรวจเช็คแบตเตอรี่ PM	
- ตรวจสอบแรงดัน 3 pin 100 mV	
- Alkaline 30 mV - 20 mV	
- วัดแรงดัน PM kit	
- ตรวจสอบอุณหภูมิ	
- ตรวจเช็ค SOPH Model - ตรวจสอบความถี่สัญญาณ	
10000725 Serial No. complete 1 PC	

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

Part No:	Batch	Description	Qty
60031807	13-10-2023	FOSS PM kit K7200 1 set of 1 unit	1

I confirm this report is accurate and complete  
Signed FOSS: [Signature] Signed Customer: [Signature]  
Name: [Name] Name: [Name]

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

เอกสารไม่ควบคุม

ภาคผนวก จ-2

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เอกสารสอบเทียบเครื่องมือ  
เดือนกุมภาพันธ์ พ.ศ. 2568

## 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
<b>Ambient</b>								
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Tisch Environmental, Inc.	TE-5025A / 3541	Jiranatee Associates Co., Ltd.	COF-046-67	5 Nov 24	5 Nov 26
2	U-Tube Manometer		Dwyer	1221-36-W/M / -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	11 Apr 25
3	Air Flow Meter	Particular Matter (PM <sub>2.5</sub> )	BGI	DeltaCal DC1 / 158850	Innovative Instrument Co., Ltd.	24-AFM-173	28 Aug 24	28 Aug 25
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	22 Apr 25
5	Dial Thermo-Hygrometer		Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H757	18 Apr 24	18 Apr 25
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C / 42C-0508011076	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
7	Nitrogen Dioxide Analyzer		Thermo Fisher Scientific	42C / 0517512000	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
8	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	15062024	4 Sep 24	4 Sep 25
10	Sulphur Dioxide Analyzer		Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	09042024	4 Sep 24	4 Sep 25
11	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31



## 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
<b>Ambient</b>								
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i / 1201497732	UAE Consultant Co.,Ltd.	09092024	9 Sep 24	9 Sep 25
13	Carbon Monoxide Analyzer		Thermo	48i / 1201497733	UAE Consultant Co.,Ltd.	14062024	14 Jun 24	14 Jun 25
14	Standard Gases (Mixture)		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	19 Sep 25
16	Total Hydrocarbons Analyzer		Thermo Scientific	55i / 1182920025	UAE Consultant Co.,Ltd.	01102024	1 Oct 24	1 Oct 25
17	Standard Gas		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	10 Apr 24	10 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	26 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	7 Aug 24	7 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	28 Aug 24	28 Aug 25

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-046-67

Page 2 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER : Top Load Orifice  
MODEL/TYPE : TISCH  
SERIAL NUMBER : TE-S025A  
ID NUMBER : 3541  
CONDITION AS-RECEIVED : UAE EFM 177/2561  
CUSTOMER : Used item  
United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,  
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 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 23.7 °C and 49.7 %RH.

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

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

**Calibration procedure:**  
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model 665 (MCG/WZ) by The MCG-CL-304 was used as a calibration guideline.

**Traceability:**  
This certificate provides a traceability of the measurement to recognized the national standards and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: IMV-0063-23.

**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 <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	$\Delta p$ meter mmHg	$\Delta p$ Orifice mmHg	$\gamma$	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	752.889	23.33	22.18	57.330	1.708	1.304	0.652
2	1.001	752.844	23.26	22.53	61.114	1.843	1.844	0.929
3	1.117	752.825	23.14	22.61	61.293	4.520	2.223	1.054
4	1.168	752.781	23.25	22.65	30.383	5.092	2.253	1.119
5	1.412	752.825	23.06	22.48	29.794	7.536	2.741	1.355

Slope (m): 2.04171  
Intercept (b): -0.02514  
Correlation coefficient (r): 0.99985  
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

Table 2: The results of  $Q$  actual calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	$\Delta p$ meter mmHg	$\Delta p$ Orifice mmHg	$\gamma$	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	752.889	23.33	22.18	57.330	1.708	0.820	0.654
2	1.001	752.844	23.26	22.53	61.114	1.843	1.159	0.922
3	1.117	752.825	23.14	22.61	61.293	4.520	1.384	1.058
4	1.168	752.781	23.25	22.65	30.383	5.092	1.416	1.123
5	1.412	752.825	23.06	22.48	29.794	7.536	1.722	1.359

Slope (m): 1.27883  
Intercept (b): -0.01883  
Correlation coefficient (r): 0.99985  
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

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

Calibrated by:  
☐ Mr. Sorajit Thachalad  
☒ Miss Atthaporn Lertsomphon

Approved signature:  
Mr. Pannya 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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### 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.: D824412  
Gas content: 6.60 M<sup>3</sup>  
Filling pressure: 137.0 bar  
Valve: CGA 570 BRASS  
Cylinder Owner: LINDE  
Cylinder Size: 50L

**Laboratory Report**

Component	Nominal Concentration	Analysis Result	Uncertainty <sup>2</sup>	Method of Analysis <sup>1</sup>	Assay Date
Methane in Air	40.0 ppm	39.8 ppm	± 1% relative	(6) FID-VI-2	4-Aug-2020

**Reference Standard used in Assay**

Reference Standard	Cylinder number	Concentration	Expiry date
Methane in Nitrogen	2519956	49.29 ± 0.39 ppm	4-Oct-2020

**Analytical Instruments used in Assay**

Instrument/Make/Model	Analytical Principle	Last Multiport Calibration
FTIR Spectrometers Nicolet 650	FTIR-CH	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 re-ordering, please quote the material number

**Note:**  
1. All results expressed in this report are on made/inde basis, unless otherwise specified. The assay of this standard has been performed in accordance with the EPA Toxicology Protocol (EPA-800/9-12/201) for the assay and Certification of known 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 the National Standard of Gases as after assigned national metrology institute.  
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Methane Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Page 1 of 1  
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**ลินเด (ประเทศไทย) จำกัด (มหาชน)**  
Linde (Thailand) Public Company Limited  
17 Floor, Bangkok Tower 6, 17th Floor 16, Bangkok Tower 6, 17th Floor, Bangkok  
Bangkok, Thailand 10110. Tel: (662) 238-6100 Fax: (662) 238-6103  
Bangkok Head: 125 Moo 1, 1 Bangpakong, Bangkok 10100  
Tel: (662) 343-570-479-51 Fax: (662) 343-570-525



## CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manut 28 Yae 4, Prasert Manut Rd., Ladphras, Bangkok 10230  
Tel: 02-078-0353-4 Fax: 02-078-2072 www.cal-labnorty.com E-mail: sale@cal-labnorty.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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# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-laboratory.com



# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-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 : (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. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 39701R, 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

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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

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# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-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

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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-AC-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

Approved By :   
Mr. Pacit 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 laboratory.

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PLA-T08-ACT-02 Rev.03 Issue date 5/4/24

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 (%)	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 calibration 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 Institute.

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24

Certificate No. : 24-ACT-091

Request No. : Req-2024-1380

Decision Rule for Statements of Conformity

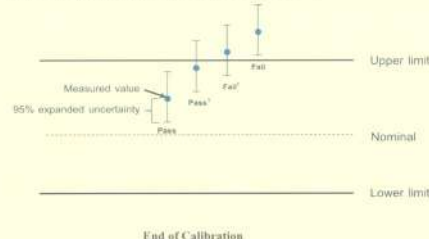
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statement

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

Pass ~ 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



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

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24



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), PRMLxT1 (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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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), PRMLxT1 (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 system
- National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSG 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

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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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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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
	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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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 --

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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.

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



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

### 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

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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

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

## 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 : 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

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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.: 24P1251  
Page : 1 of 2

Equipment : U Tube Manometer  
Manufacturer: Dwyer  
Model : 1221-36-W/M  
Serial No.: -  
ID No.: UAE,EFM,077/2566

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: 1012 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-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 inH<sub>2</sub>O

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  
[✓] Attapol Panurach

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Cert.No.: 24P1251  
Page : 2 of 2

## Result of calibration:- Without adjustment

Function:- Pressure Measurement  
Increasing PressureRange : 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>OScale Interval : 0.1 inH<sub>2</sub>O ( The Second Estimate )

Applied Pressure	High-port side	UUC Indication		ΔP	Error
		Low-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	7.05	-7.05	14.10	0.10	0.10
16.00	8.05	-8.05	16.10	0.10	0.10
18.00	9.05	-9.05	18.10	0.10	0.10
20.00	10.05	-10.05	20.10	0.10	0.10
22.00	11.05	-11.05	22.10	0.10	0.10
24.00	12.05	-12.05	24.10	0.10	0.10
26.00	13.05	-13.05	26.10	0.10	0.10
28.00	14.05	-14.05	28.10	0.10	0.10
30.00	15.05	-15.05	30.10	0.10	0.10
32.00	16.05	-16.10	32.15	0.15	0.15
34.00	17.05	-17.10	34.15	0.15	0.15
36.00	18.00	-18.00	36.00	0.20	0.20

The uncertainty of measurement was ± 0.11 inH<sub>2</sub>O

\* 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

Certificate No : 24-AFM-173

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10269

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : BGI Accuracy : 0.75% of Reading

Model : Delta Cal DC1 Sensor Model : \*

Serial Number : 158850 Sensor Serial Number : \*

ID : UAE.EFM.038/2561 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	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

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

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

Calibration By :  
Mr. Noppadon Luangart  
Service Calibration Engineer

Approved By :  
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor




Issue Date : 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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL. : 0660-2116-5960-1 FAX. : 0660-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2801

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Certificate No : 24-AFM-173

Request No : Req-2024-1833

Decision Rule for Statements of Conformity

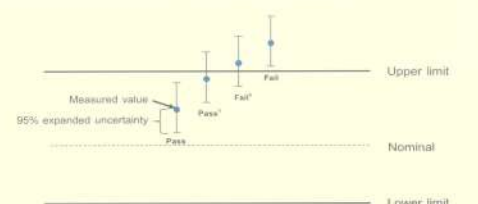
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G09:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass\* = 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.



Measured value  
95% expanded uncertainty  
Upper limit  
Nominal  
Lower limit

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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	35.88	35.73	-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 :  
$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{meas}}{T_{ref}}$$
  
where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature  
Meas = Measurement Condition ref = Standard Condition




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

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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL. : 0660-2116-5960-1 FAX. : 0660-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2801

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Certificate of Calibration

Customer

Certificate No : 24-TPM-390

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

Address : 81 Soi Udomsak 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 : 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/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  
29 August 2024

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



Calibration Note  
UUC Adjustment : Not Adjust

Certificate No : 24-TPM-101  
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
Tt	45.008	45.2	-0.2	0.13
	50.007	50.2	-0.2	0.13

End of Certificate

Calibrated By :  
Mr. Sittichok Jarapukdeesakul

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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.  
FId-708-1795-01 Rev. 01 Issue date 13/02/20

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, Bangkok, 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)

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Calibrated by : Suksan Khankaew  
Issue Date : 23 April 2024

Approved Signatory :  
[ ] Phalinee Pratsapaipal  
[ ] Sura Suwannasari  
[✓] Attapol Panurach



Cert.No.: 24P1369  
Page: 2 of 2

Result of calibration:- Without adjustment  
Function:- Absolute Pressure Measurement  
Increasing Pressure  
Range : 720 mmHg to 780 mmHg  
Scale Interval : 1 mmHg ( The Fifth Estimate )

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, Bangkok, 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), NSG-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.: 24H757  
Page.: 2 of 2

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

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 based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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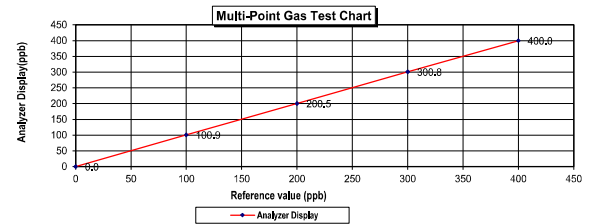
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.28



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4 Oct 2024

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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

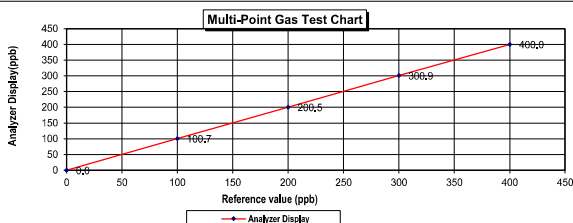
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.25



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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 Gaseous Calibration Standards" (May 2012) document EPA 900/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. 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	06/29/2023
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	96.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2191101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 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	9.893 PPM NITROGEN DIOXIDE/NITROGEN	±1.0%	Sep 29, 2025
NTRM	180102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CC7456002	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025

The GTRM, 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 <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

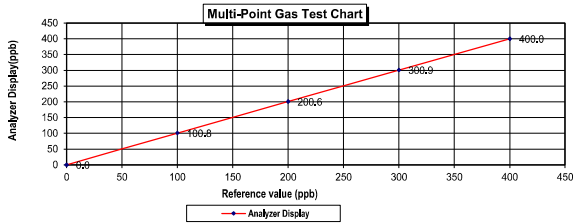
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

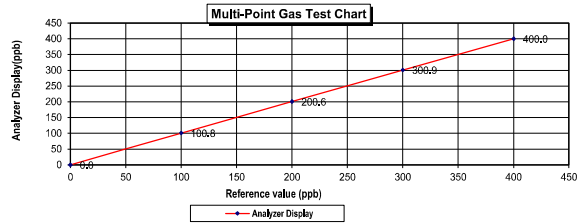
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)  
LTD.  
Part Number: E05N191E15A0014  
Cylinder Number: E05162121  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12023  
Gas Code: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 molar/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	06/29/2023
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	96.52 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	+/- 1.0%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iSSO FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATEE N1-D8-180	NDIR	Jun 14, 2023
Nicolet iSSO FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iSSO FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iSSO FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

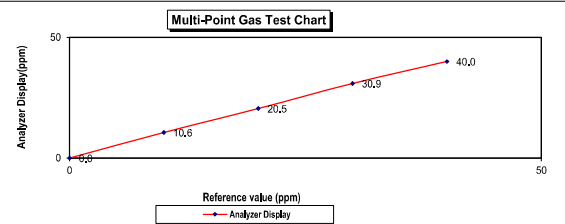
Test Date : Sep 9, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	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
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.5	0.5	2.4
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		Average Difference (%)		2.20
:Acceptable Limit $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

Test Date : June 14, 2024

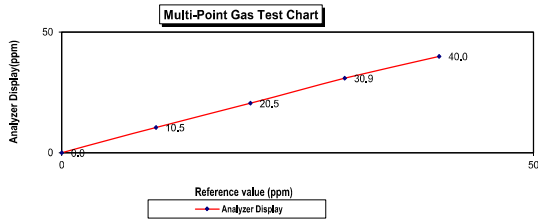
Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77 PPM	Model :	146i
Methane (CH <sub>4</sub> )	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9 PPM		
Cylinder No. :	EB0159156		
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
Level 2 20.00%	10.5	0.5	4.8	4.8
Level 3 40.00%	20.5	0.5	2.4	2.4
Level 4 60.00%	30.9	0.9	2.9	2.9
Level 5 80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range 50.0 ppm		Average Difference (%)		2.02

:Acceptable Limit  $\pm$  5%



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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 molar/molar 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
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
GMIS	104202308	CC754364	96.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%
GMIS	2023042525	CC754381	96.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	12409	D913860	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%
GMIS	15340202002	E90130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%
NTRM	180102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
CO	230801	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

เอกสารไม่ควบคุม

### MULTI-POINT GAS TEST REPORT

Test Date : Sep 19, 2024

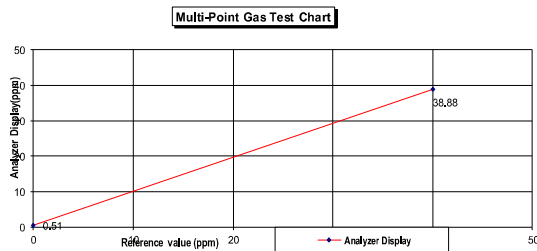
Equipment : Hydrocarbon Analyzer Model : APHA-370  
Manufacturer : HORIBA Serial Number : GAL13KSE

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH <sub>4</sub> )	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	0.51	0.51	0.51	0.51
Level 2 80.00%	38.88	-1.12	-2.88	2.88
Remark : Measuring Range 50.00 ppm		Average Difference (%)		1.70

:Acceptable Limit  $\pm$  5%



Calculate by

Approve by

19/9/2567

19/Sep/2024

Page 1 of 1

เอกสารไม่ควบคุม

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 1, 2024

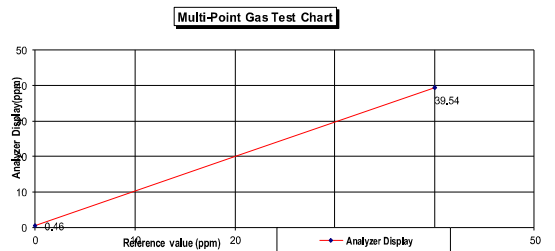
Equipment : Hydrocarbon Analyzer Model : 55i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920025

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	- PPM	Manufacturer :	
Nitric Oxide (NO)	- PPM	Model :	
Methane (CH <sub>4</sub> )	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	0.46	0.46	0.46	0.46
Level 2 80.00%	39.54	-0.46	-1.16	1.16
Remark : Measuring Range 50.00 ppm		Average Difference (%)		0.81

:Acceptable Limit  $\pm$  5%



Calculate by

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1/10/2567

1/Oct/2024

Page 1 of 1

เอกสารไม่ควบคุม



### 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	Total Dissolved Solids	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	Biochemical Oxygen Demand	ARCO	UC4-1320 / -	Technology Promotion Association (Thailand-Japan)	24TM1114	11 Jul 24	11 Jul 25
5	DO Meter	Biochemical Oxygen Demand	YSI	4010-2W / 20260326	Technology Promotion Association (Thailand-Japan)	24TW222	17 Oct 24	17 Oct 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	13319	27 Jan 25	27 Jan 26
8	Kjeltec Distillation Unit	Total Kjeldahl Nitrogen	FOSS	KT9 Distillator / 91905393	FOSS South East Asia	12875	5 Jul 24	5 Jul 25
9	pH Meter	pH	Horiba	LAQUA-PH210 / HA0C0025	Technology Promotion Association (Thailand-Japan)	24CH319	14 Mar 24	13 Mar 25

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



## 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 200g	8505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 015/23	Quality Reborn	QB24-0343	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:

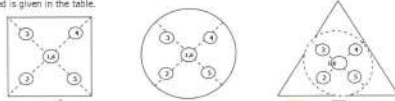
1. Repeatability of Reading:

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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร  
2008 Soi 36, Asoke Asoke Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10710, Thailand  
Tel : +66(0) 2422 8668 Fax : +66(0) 2422 8545



## 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 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	0.000000	0.00000	0.00000	0.0000086	2.00
0.001	0.001003	0.00101	-0.00001	0.0000089	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.049996	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	2.000023	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	20.00000	0.00003	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	80.000068	80.00002	0.00005	0.00011	2.00

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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร  
2008 Soi 36, Asoke Asoke Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10710, Thailand  
Tel : +66(0) 2422 8668 Fax : +66(0) 2422 8545



## 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 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	90.00010	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-009 Revision: 01 Date: 20-04-65

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร  
2008 Soi 36, Asoke Asoke Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10710, Thailand  
Tel : +66(0) 2422 8668 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 Papawuttipong  
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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร  
2008 Soi 36, Asoke Asoke Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10710, Thailand  
Tel : +66(0) 2422 8668 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 B505567572 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 QR24-0343 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:**

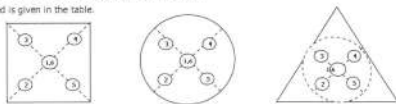
**1. Repeatability of Reading:**

Nominal Value ( g )	Standard Deviation of Reading ( g )
40	0.000052
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 ( g )	2 ( g )	3 ( g )	4 ( g )	5 ( g )	6 ( g )	(Maximum Difference) ( 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 35 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
2008 Soi 35, Asoke Asoke Road, Bang Yai Khon Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2142 8688 Fax: +66(0) 2142 8545 **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	0.000000	0.00000	0.00000	0.000088	2.00
0.001	0.001003	0.00101	-0.00001	0.000091	2.00
0.005	0.005003	0.00499	0.00001	0.000094	2.00
0.01	0.010003	0.01000	0.00000	0.000091	2.00
0.05	0.049996	0.05000	0.00000	0.000096	2.00
0.1	0.100011	0.10000	0.00001	0.000111	2.00
0.5	0.500016	0.50001	0.00001	0.000104	2.00
1	1.000003	1.00002	-0.00002	0.000106	2.00
2	2.000023	2.00001	0.00001	0.000107	2.00
5	5.000017	5.00002	0.00000	0.000100	2.00
10	10.000009	10.00000	0.00001	0.000106	2.00
20	20.000031	20.00002	0.00001	0.000107	2.00
30	30.000040	30.00003	0.00001	0.000105	2.00
50	50.000028	50.00004	-0.00001	0.000108	2.00
80	80.000068	80.00005	0.00002	0.000111	2.00

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

2008 35 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
2008 Soi 35, Asoke Asoke Road, Bang Yai Khon Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2142 8688 Fax: +66(0) 2142 8545 **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: 0.0001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor
90	90.00010	90.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	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	200.0000	0.0002	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 35 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
2008 Soi 35, Asoke Asoke Road, Bang Yai Khon Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel: +66(0) 2142 8688 Fax: +66(0) 2142 8545 **เอกสารไม่ควบคุม**

## Certificate of Calibration

**Cert. No.:** 24TM1114  
**Page :** 1 of 3

**Equipment :** BOD Incubator  
**Manufacturer :** ARCO  
**Model :** UC4-1320  
**Serial No. :** -  
**ID No. :** UAE.WAO.018/2559  
**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 :** 11 July 2024  
**Calibration Date :** 11 July 2024  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Tawatchai Pama  
**Approved by :**   
Approved Signatory  
( ) Ponpan Palimp  
(✓) Suwit Imjai  
( ) Kunchit Promprat

**Issue Date :** 14 July 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 : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2407-0243OC-2

Cert. No.: 24TM1114  
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.

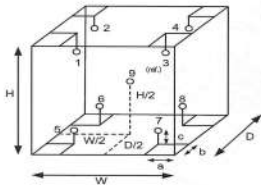
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	29	29
REL.Humid. ( % )	78	72
AC Supply ( Volt )	233	234

Position :	Ref. Std. ID No.:
1	20-16RTD-10
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 = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m<sup>3</sup>

เอกสารไม่ควบคุม



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2407-0243OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 24TM1114  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.361	19.640	20.312	20.079	19.908	19.872	19.955	19.818	19.758	0.48

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 %.

-o0o-

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

## Certificate of Testing

Cert.No.: 24TW222  
Page.: 1 of 2

Equipment : DO Meter  
Manufacturer : YSI  
Model : 4010-2W  
Serial No. : 20260326  
ID No. : UAE.WAO.060/2563  
Received Date : 16 October 2024  
Test Date : 17 October 2024  
Reference : 2410-0532DSC-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 Sirithean

Approved by :

Approved Signatory

( ) Unnopphol Harachai  
( ) Ponpan Paipim  
(✓) Salthip Meangmal

Issue Date : 17 October 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW222  
Page.: 2 of 2

#### Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.8%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 22M102385

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.18	8.24	0.0071

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

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

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

## 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 : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Man Pattanapongpaiboon

Approved by :   
Approved Signatory

( ) Ponpan Palpim  
(✓) 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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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.

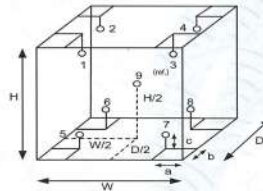
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

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 m<sup>3</sup>

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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# 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.: 13319

Date: 27 Jun 2025

Customer: UAE

Job No.: 11615

Address: Bangkok

Instrument: KT200

Serial: 9199524

Travel To Customer (Hrs)
09:00
10:00

Labour (Hrs)
10:00
13:00

Travel From Customer (Hrs)
-
-

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

PMA Type		Smartcare		Smartcare Pro		Fosscore	
Smartcare Advance		x		Fosscore Pro	x	N/A	x

Details of Work / Test	
- PM -	
+ Visual Check	
- No leak	
- hose damage on heater & main switch	- ok
+ heater heater 10- main switch information V/A	- ok
+ 100% PM kit + 1 set	- ok
+ Function Check	
- Power on/off	ok
- Alarm	
- Steam	
- Condenser	
Instrument Ready for Use	OK

Part No.	Batch	Description	Qty
1006965	11.06.2024	FOSS PM kit KT200 heater Analyser/2100	1
10004512	25.03.2024	Heating element Steam	1
1562011	19.10.2022	Unit + de-12595kmt + 2 PM	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name
Email	Customer Contact:

\*Remark:

## Customer Service Report

Date:	July 5, 2024	Report No.:	12875
Job No.:	8319	Customer:	UAE
Instrument:	KT9 Distillator	Address:	Bangkok
		Serial:	91905393
Start	Travel To Customer (Hrs)	Labour (Hrs)	Travel From Customer (Hrs)
Finish	09.30	09.30	14.30
	09.30	14.30	16.00

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

PMA Type	Smartcare	Smartcare Pro	Fosscore	A
	Smartcare Advance	Fosscore Pro	N/A	

Details of Work / Test	
- PM -	
- Visual Check -	
+ No leak	
+ No damage	
- Change PM kit x1 set	OK
- Function Check -	
+ Dilution 80 mL →	
+ Alkali 50 mL →	
+ Receiver N/A → Notice	
+ Hecan / Drain	
Blank =	
Below up	
Recovery	
SP =	
Follow up	
Instrument Ready for Use	OK
	X
	Not OK*

Part No.	Batch	Description	Qty
6 0100146	02-01-2024	PM kit KJLtec 9 Distillator	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name
Email	Customer Contact

\*Remark:

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. 0-2717-3000-29 FAX. 0-2719-9484



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

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH210  
Serial No. : HA0C0025  
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 Udumsk 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 Lemgagtrakul

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.

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Cert.No.: 24CH319  
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	231908	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
	pH	mV	mV	pH		
pH Meter S/N.: HA0C0025	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



Cert.No.: 24CH319  
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 (±)	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	0.0095	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 (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °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

เดือนมีนาคม พ.ศ. 2568



## 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
<b>Ambient</b>								
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Tisch Environmental, Inc.	TE-5025A / 3541	Jiranatee Associates Co., Ltd.	COF-046-67	5 Nov 24	5 Nov 26
2	U-Tube Manometer		Dwyer	1221-36-W/M / -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	11 Apr 25
3	Air Flow Meter	Particular Matter (PM <sub>2.5</sub> )	BGI	DeltaCal DC1 / 158850	Innovative Instrument Co., Ltd.	24-AFM-173	28 Aug 24	28 Aug 25
4	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	22 Apr 25
5	Dial Thermo-Hygrometer		Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H757	18 Apr 24	18 Apr 25
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C / 42C-0508011076	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
7	Nitrogen Dioxide Analyzer		Thermo Fisher Scientific	42C / 0517512000	UAE Consultant Co., Ltd.	04102024	4 Oct 24	4 Oct 25
8	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	15062024	4 Sep 24	4 Sep 25
10	Sulphur Dioxide Analyzer		Thermo Scientific	43i / 1182920017	UAE Consultant Co., Ltd.	09042024	4 Sep 24	4 Sep 25
11	Standard Gases (Mixture)		Airgas	EB0162121 / 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31

## 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
<b>Ambient</b>								
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i / 1201497732	UAE Consultant Co.,Ltd.	09092024	9 Sep 24	9 Sep 25
13	Carbon Monoxide Analyzer		Thermo	48i / 1201497733	UAE Consultant Co.,Ltd.	14062024	14 Jun 24	14 Jun 25
14	Standard Gases (Mixture)		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	19 Sep 25
16	Total Hydrocarbons Analyzer		Thermo Scientific	55i / 1182920025	UAE Consultant Co.,Ltd.	01102024	1 Oct 24	1 Oct 25
17	Standard Gas		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	10 Apr 24	10 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	26 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	7 Aug 24	7 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	28 Aug 24	28 Aug 25

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-046-67

Page 2 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER : Top Load Orifice  
MODEL/TYPE : TISCH  
SERIAL NUMBER : TE-S025A  
ID NUMBER : 3541  
CONDITION AS-RECEIVED : UAE EFM 177/2561  
CUSTOMER : Used item  
United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,  
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 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 23.7 °C and 49.7 %RH.

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

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

**Calibration procedure:**  
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model 665(MC/WZ) by The MFC-504 was used as a calibration guideline.

**Traceability:**  
This certificate provides a traceability of the measurement to recognized the national standards and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: IMV-0063-23.

**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 <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Δp_meter mmHg	Δp_Orifice mmHg	Y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	752.889	23.33	22.18	57.330	1.708	1.304	0.652
2	1.001	752.844	23.26	22.53	61.114	1.843	1.844	0.929
3	1.117	752.825	23.14	22.61	61.293	4.520	2.223	1.054
4	1.168	752.781	23.25	22.65	30.383	5.092	2.253	1.119
5	1.412	752.825	23.06	22.48	29.794	7.536	2.741	1.355

Slope (m): 2.04171  
Intercept (b): -0.02514  
Correlation coefficient (r): 0.99985  
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Δp_meter mmHg	Δp_Orifice mmHg	Y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	752.889	23.33	22.18	57.330	1.708	0.820	0.654
2	1.001	752.844	23.26	22.53	61.114	1.843	1.159	0.922
3	1.117	752.825	23.14	22.61	61.293	4.520	1.384	1.058
4	1.168	752.781	23.25	22.65	30.383	5.092	1.416	1.119
5	1.412	752.825	23.06	22.48	29.794	7.536	1.722	1.359

Slope (m): 1.27883  
Intercept (b): -0.01883  
Correlation coefficient (r): 0.99985  
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

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

Calibrated by:  
☐ Mr. Sorajit Thachalad  
☒ Miss Atthaporn Lertsomphul

Approved signatory:  
Mr. Parinya Booncharoen  
Calibration Department Manager

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



### Certificate of Analysis Special Gases Mixture

**Customer Details**  
Name: United Analyst & Engineering Co., Ltd.  
Address: 3 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.: D824412  
Gas content: 6.60 M<sup>3</sup>  
Filling pressure: 137.0 bar  
Valve: CGA 570 BRASS  
Cylinder Owner: LINDE  
Cylinder Size: 50L

**Laboratory Report**

Component	Nominal Concentration	Analysis Result	Uncertainty <sup>2</sup>	Method of Analysis <sup>1</sup>	Assay Date
Methane in Air	40.0 ppm	39.8 ppm	± 1% relative	(6) FID-VI-2	4-Aug-2020

**Reference Standard used in Assay**

Reference Standard	Cylinder number	Concentration	Expiry date
Methane in Nitrogen	2519956	49.29 ± 0.19 ppm	4-Oct-2020

**Analytical Instruments used in Assay**

Instrument/Make/Model	Analytical Principle	Last Multiport Calibration
FTIR Spectrometers Nicolet 650	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 re-ordering, please quote the material number

**Note:**  
1. All results expressed in this report are in metric units, unless otherwise specified. The assay of this standard has been performed in accordance with the EPA Toxicology Protocol (EPA-800/9-12/201) for the assay and certification of known 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 the National Standard of Gas in the International Union of Pure and Applied Chemistry (IUPAC).  
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Methane Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Page 1 of 1  
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**Linde (Thailand) Public Company Limited**  
17th Floor, Bangkok Tower 6, 17th Floor 14, Bangkok Tower 6, 17th Floor, Bangkok  
Bangkok, Thailand 10110. Tel: (66) 2380-6100 Fax: (66) 2380-6103  
Bangkok Head Office: 105 Moo 1, Bangpakong, Bangkok, Thailand 10110  
Tel: (66) 2380-6100 Fax: (66) 2380-6103



## CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manukit 28 Yaek 4, Prasert Manukit Rd., Ladphras, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2072 www.cal-lab.com E-mail: sale@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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# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-laboratory.com



# CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-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 : (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. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 39701R, 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

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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 Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.ccl-laboratory.com E-mail: sale@ccl-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

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#### INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7-10 MOO 13, SOI SUNTISAKORN 11, TAMBON BANG KAEU,

AMPHOE BANG PHU KAMU, FRAKANG PROVINCE, 10740 THAILAND

TEL : 0608-2110-5800-1 FAX: 060-62110-7140



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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. : 24-AC-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

Approved By :   
Mr. Pacit 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 laboratory.

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IN-708-ACT-02 Rev.03 Issue date 5/4/24

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 calibration 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 Institute.

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24

Certificate No. : 24-ACT-091

Request No. : Req-2024-1380

Decision Rule for Statements of Conformity

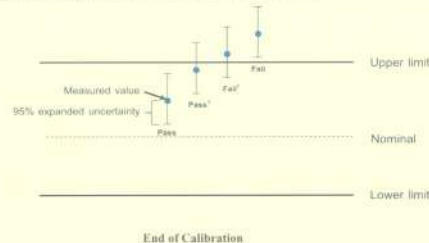
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statement

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

Pass ~ 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



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

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FIM-708-ACT-02 Rev 03 Issue date 5/6/24



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), PRMLxT1 (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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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), PRMLxT1 (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 system
- 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

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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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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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
	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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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 --

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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), 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

### 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

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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

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

## 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

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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

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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.: 24P1251  
Page : 1 of 2

Equipment : U Tube Manometer  
Manufacturer: Dwyer  
Model : 1221-36-W/M  
Serial No.: -  
ID No.: UAE,EFM,077/2566

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: 1012 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-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 inH<sub>2</sub>O

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  
[✓] Attapol Panurach

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Cert.No.: 24P1251  
Page : 2 of 2

## Result of calibration:- Without adjustment

Function:- Pressure Measurement  
Increasing PressureRange : 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>OScale Interval : 0.1 inH<sub>2</sub>O ( The Second Estimate )

Applied Pressure	High-port side	UUC Indication		ΔP	Error
		Low-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	7.05	-7.05	14.10	0.10	0.10
16.00	8.05	-8.05	16.10	0.10	0.10
18.00	9.05	-9.05	18.10	0.10	0.10
20.00	10.05	-10.05	20.10	0.10	0.10
22.00	11.05	-11.05	22.10	0.10	0.10
24.00	12.05	-12.05	24.10	0.10	0.10
26.00	13.05	-13.05	26.10	0.10	0.10
28.00	14.05	-14.05	28.10	0.10	0.10
30.00	15.05	-15.05	30.10	0.10	0.10
32.00	16.05	-16.10	32.15	0.15	0.15
34.00	17.05	-17.10	34.15	0.15	0.15
36.00	18.00	-18.00	36.00	0.20	0.20

The uncertainty of measurement was ± 0.11 inH<sub>2</sub>O

\* 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

Certificate No : 24-AFM-173

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

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 : 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	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

Approved By : Mr. Pacit Mathavorn  
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

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	15.88	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 :  
$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{meas}}{T_{ref}}$$
  
where : Q = Flow Rate      P = Absolute Pressure      T = Absolute Temperature  
Meas = Measurement Condition      ref = Standard Condition




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

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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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL : 0660-2116-5960-1 FAX: 0660-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2801

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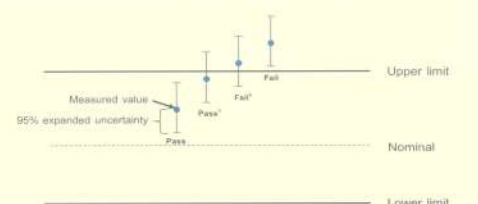
Certificate No : 24-AFM-173

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-G09:2019: Guidelines in 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 = 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.



Measured value  
95% expanded uncertainty  
Upper limit  
Nominal  
Lower limit  
Pass  
Fail



End of Certificate

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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEU,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL : 0660-2116-5960-1 FAX: 0660-2116-7140



ANAB National Accreditation Board  
A C C R E D I T E D  
CALIBRATION LABORATORY  
NC 2801

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Certificate of Calibration

Customer

Certificate No : 24-TPM-390

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No : Req-2024-1833

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

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 Luangart  
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 Note  
UUC Adjustment : Not Adjust

Certificate No : 24-TPM-101  
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
50.007	49.8	+0.2	0.13	
Tt	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. Sittichok Jarapukdeesakul

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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 Pratspaipal  
[ ] Sura Suwannasari  
[✓] Attapol Panurach

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Cert.No.: 24P1369  
Page: 2 of 2

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

Range : 720 mmHg to 780 mmHg  
Scale Interval : 1 mmHg ( The Fifth Estimate )

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 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), NSG-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.: 24H757  
Page.: 2 of 2

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

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 based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

-o-o-

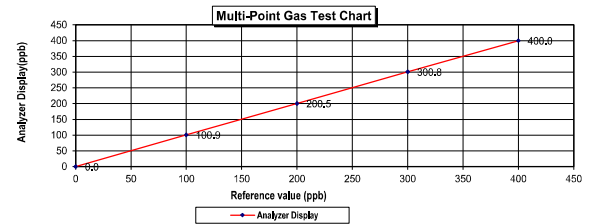
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.28



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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

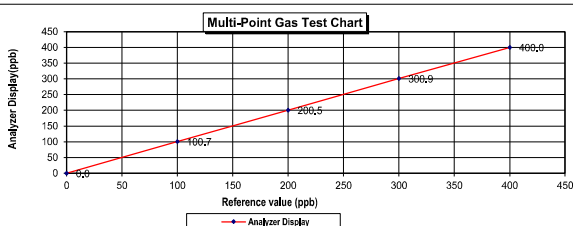
Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB0159156		
Expiration Date :	Nov 6, 2026		

### 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  
:Acceptable Limit ± 5%

Average Difference (%) 0.25



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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 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	06/29/2023
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	96.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 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	E90130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	±1.0%	Sep 29, 2025
NTRM	180102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CC745602	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	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 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

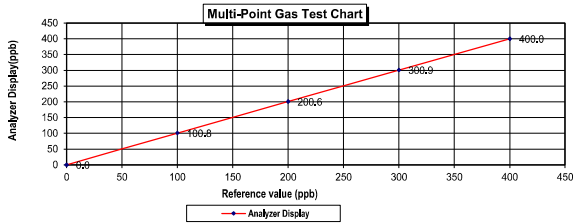
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

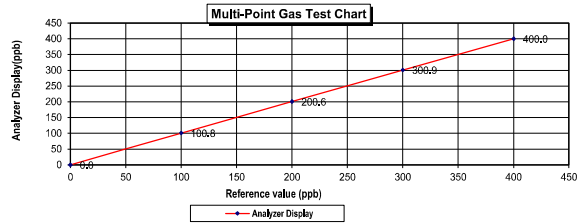
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### 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 $\pm 5\%$					



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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 molar/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	+/- 0.5% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.5% 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	06/29/2023
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	96.52 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	+/- 1.0%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

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

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### MULTI-POINT GAS TEST REPORT

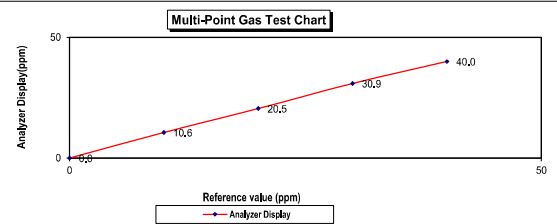
Test Date : Sep 9, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	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
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.5	0.5	2.4
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		Average Difference (%)		2.20
:Acceptable Limit $\pm 5\%$					



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### MULTI-POINT GAS TEST REPORT

Test Date : June 14, 2024

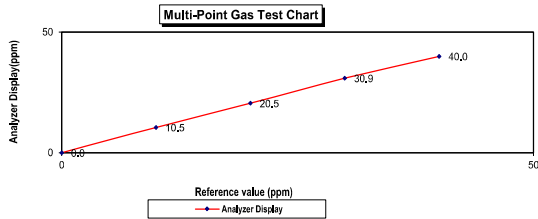
Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9	PPM	
Cylinder No. :	EB0159156		
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
Level 2 20.00%	10.5	0.5	4.8	4.8
Level 3 40.00%	20.5	0.5	2.4	2.4
Level 4 60.00%	30.9	0.9	2.9	2.9
Level 5 80.00%	40.0	0.0	0.0	0.0

Remark : Measuring Range 50.0 ppm Average Difference (%) 2.02  
:Acceptable Limit  $\pm$  5%



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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, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, 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 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 molar/molar 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
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
GMIS	104202308	CC754364	96.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%
GMIS	2023042525	CC754381	96.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
PRM	12409	D913860	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%
GMIS	15340202002	E90130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
CO	239801	CC745602	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%
NTRM	130606-02	CC411738	13.358 PPM CARBON DIOXIDE/NITROGEN	+/- 0.6%

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 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

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### MULTI-POINT GAS TEST REPORT

Test Date : Sep 19, 2024

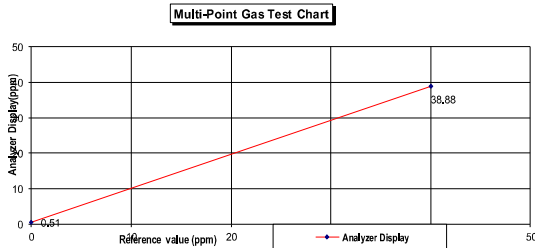
Equipment : Hydrocarbon Analyzer Model : APHA-370  
Manufacturer : HORIBA Serial Number : GAL13KSE

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH <sub>4</sub> )	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	0.51	0.51	0.51	0.51
Level 2 80.00%	38.88	-1.12	-2.88	2.88

Remark : Measuring Range 50.00 ppm Average Difference (%) 1.70  
:Acceptable Limit  $\pm$  5%



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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 1, 2024

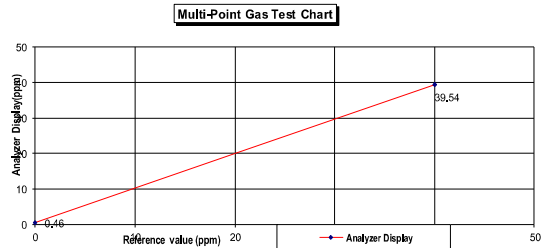
Equipment : Hydrocarbon Analyzer Model : 55i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920025

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH <sub>4</sub> )	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	0.46	0.46	0.46	0.46
Level 2 80.00%	39.54	-0.46	-1.16	1.16

Remark : Measuring Range 50.00 ppm Average Difference (%) 0.81  
:Acceptable Limit  $\pm$  5%



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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	Total Dissolved Solids	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	Biochemical Oxygen Demand	ARCO	UC4-1320 / -	Technology Promotion Association (Thailand-Japan)	24TM1114	11 Jul 24	11 Jul 25
5	DO Meter	Biochemical Oxygen Demand	YSI	4010-2W / 20260326	Technology Promotion Association (Thailand-Japan)	24TW222	17 Oct 24	17 Oct 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	13319	27 Jan 25	27 Jan 26
8	Kjeltec Distillation Unit	Total Kjeldahl Nitrogen	FOSS	KT9 Distillator / 91905393	FOSS South East Asia	12875	5 Jul 24	5 Jul 25
9	pH Meter	pH	Horiba	LAQUA-PH210 / HA0F0026	Technology Promotion Association (Thailand-Japan)	25CH22	9 Jan 25	9 Jan 26

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



## Certificate of Calibration

Cert.No.: 24MM292  
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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 Sol 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 :   
( ) Ponpan Paipim  
( ) 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)	15884	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

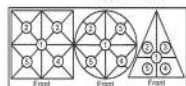


Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2405-0166OC-1  
Result of calibration

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 %.

-00-

เอกสารไม่ควบคุม



มูลนิธิสถาบันวิจัยและพัฒนาอาหาร  
ศูนย์บริการข้อมูลวิชาการและอาหาร  
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,  
Bangchack, Prakhonong, 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.

FC-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: 0.00001 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 200g	850567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 015/23	Quality Reborn	QB24-0343	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:

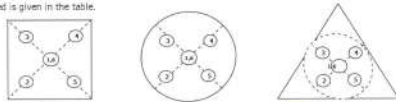
1. Repeatability of Reading:

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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงบางนา เขตบางนา กรุงเทพมหานคร  
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8668 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: 0.00001 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	0.000000	0.00000	0.00000	0.0000086	2.00
0.001	0.001003	0.00101	-0.00001	0.0000089	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.049996	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	2.000023	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	20.00000	0.00003	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	80.000068	80.00002	0.00005	0.00011	2.00

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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงบางนา เขตบางนา กรุงเทพมหานคร  
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8668 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: 0.00001 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-009 Revision: 01 Date: 20-04-65

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงบางนา เขตบางนา กรุงเทพมหานคร  
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8668 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 Papawuttipong  
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

2008 เอสอีอีเอ็ม 36 ถนนสุขุมวิท แขวงบางนา เขตบางนา กรุงเทพมหานคร  
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8668 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 B505567572 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 QR24-0343 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:

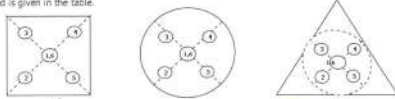
1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
40	0.000052
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



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	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00499	0.00001	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: 0.0001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor
90	90.00010	90.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	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	200.0000	0.0002	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



เอกสารไม่ควบคุม

## Certificate of Calibration

Cert. No.: 24TM1114  
Page : 1 of 3

Equipment : BOD Incubator  
Manufacturer : ARCO  
Model : UC4-1320  
Serial No. : -  
ID No. : UAE.WAO.018/2559  
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 : 11 July 2024  
Calibration Date : 11 July 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Tawatchai Pama  
Approved by :  
( ) Ponpan Palpim  
(✓) Suwit Imjai  
( ) Kunchit Promprat  
Issue Date : 14 July 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 : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2407-0243OC-2

Cert. No.: 24TM1114  
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.

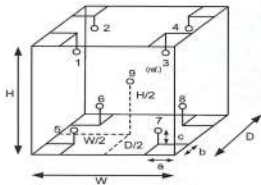
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	29	29
REL.Humid. ( % )	78	72
AC Supply ( Volt )	233	234

Position :	Ref. Std. ID No.:
1	20-16RTD-10
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 = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m<sup>3</sup>

เอกสารไม่ควบคุม



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2407-0243OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 24TM1114  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.361	19.640	20.312	20.079	19.908	19.872	19.955	19.818	19.758	0.48

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 %.

-o0o-

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. 0-2717-3600 FAX. 0-2719-9484

## Certificate of Testing

Cert.No.: 24TW222  
Page.: 1 of 2

Equipment : DO Meter  
Manufacturer : YSI  
Model : 4010-2W  
Serial No. : 20260326  
ID No. : UAE.WAO.060/2563  
Received Date : 16 October 2024  
Test Date : 17 October 2024  
Reference : 2410-0532DSC-1  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, 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 Signatory

( ) Unnopphol Harachai  
( ) Ponpan Paipim  
(✓) Salthip Meangmal

Issue Date : 17 October 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW222  
Page.: 2 of 2

#### Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.8%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 22M102385

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.24	0.0071

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

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

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

## 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, Phra Khanong,  
Bangkok 10260  
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 :   
Approved Signatory

( ) Ponpan Palpim  
(✓) 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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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.

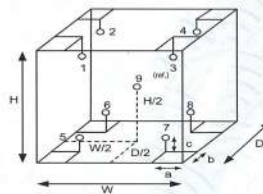
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

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 m<sup>3</sup>

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

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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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# 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.: 13319

Date: 27 Jun 2025

Customer: UAE

Job No.: 11615

Address: Bangkok

Instrument: KT200

Serial: 91990524

Travel To Customer (Hrs)	
09:00	1
10:00	

Labour (Hrs)	
10:00	3
13:00	

Travel From Customer (Hrs)	

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

PMA Type		Smartcare		Smartcare Pro		FossCare	
Smartcare Advance	x			FossCare Pro	x	N/A	x

Details of Work / Test	
- PM -	
+ Visual Check	
- No leak	
- hose damage on heater & main switch	- ok
+ heater main switch	information V/A - ok
+ 100% PM kit + 1 set	- ok
+ Function Check	
- Power on/off	ok
- Alarm	
- Steam	
- Condenser	
Instrument Ready for Use	OK

Part No.	Batch	Description	Qty
10069965	11.06.2024	FOSS PM kit KT200 Steamer Analyser/2100	1
10004512	25.03.2024	Heating element Steam	1
15620111	19.10.2022	Unit with 2.5kg/h + 2 PM	1

I confirm this report is accurate and complete

Signed FOSS	Signed Customer
Name	Name

Email: Customer Contact: Remark:

## 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.: 12875

Customer: UAE

Address: Bangkok

Serial: 91905393

Date: July 5, 2024  
Job No.: 8315  
Instrument: KTA Distillater

Start	Finish	Travel To Customer (Hrs)	Labour (Hrs)	Travel From Customer (Hrs)
08:30	09:30	1	09:30	1.5
			14:30	
			5	

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

PMA Type	Smartcare	Smartcare Pro	Fosscore	A
	Smartcare Advance	Fosscore Pro	N/A	

Details of Work / Test	
- PM -	
- Visual Check -	
+ No leak	
+ No drawing	
- Change PM kit x1 set	ok
- Function Check -	
+ Dilution 80 mL →	
+ Alkali 50 mL → 5% mL	
+ Receiver N/A → Native	
+ Hecm / Drain	
Blank =	
Follow up	
Instrument Ready for Use	OK
	X
	Not OK*

Part No.	Batch	Description	Qty
60100196	02-01-2024	PM kit KTA Distillater	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name

Email: Customer Contact: เอกสารไม่ควบคุม

\*Remark:



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.: 25CH22  
Page.: 1 of 3

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH210  
Serial No. : HA0F0026  
ID No. : UAE.EFM.068/2564(EFM.pH.01/64)  
Condition As-Received: Used Item  
Received Date : 08 January 2025  
Calibration Date : 09 January 2025  
Reference : 2501-0223WSC-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 DC voltage standard and direct measurement with certified reference material (CRM)  
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagtrakul

Approved by : Approved Signatory

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

Issue Date : 10 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 25CH22  
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	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

## 2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,  
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00  
: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	1034203	27 Sep 2026
pH 7.000	Hach Lenge GmbH	C03185	09 July 2026
pH 10.010	CPA chem	1034205	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
	pH	mV	mV	pH		
pH Meter S/N: HA0F0026	4.00	177.48	177.5	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	-177.3	10.01	0.058	2.00

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#### 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.: -	4,008	4,01	186,1	0,0071	2,00
	7,000	7,00	10,2	0,0095	2,00
	7,000	7,00	10,0	0,0095	2,00
	10,010	10,01	-164,3	0,0092	2,00

Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : -

Dimension of probe

- Length : 104 mm.

- Diameter : 16 mm.

- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ( $\pm$ °C)	Coverage factor $k$
15,0	15,002	15,0	-0,002	0,13	2,00
30,0	30,002	30,0	-0,002	0,13	2,00
45,0	45,004	45,0	-0,004	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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