

## ภาคผนวกที่ 5

เอกสารสอบเทียบเครื่องมือ

## List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<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 3383	Jiranatee Associates Co., Ltd.	CL-003-65	26 Jul 22	25 Jul 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H756	10 Apr 24	9 Apr 25	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM08130002	UAE Consultant Co., Ltd.	01112023	1 Nov 23	31 Oct 24	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050148	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050149	UAE Consultant Co., Ltd.	01112023	1 Nov 23	31 Oct 24	-
8	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Horiba	APMA-370 YRLHTB7G	UAE Consultant Co., Ltd.	08122023	8 Dec 23	7 Dec 24	-
10	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-65506-348	UAE Consultant Co., Ltd.	08122023	8 Dec 23	7 Dec 24	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i CM08140004	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	-
12	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-

## CERTIFICATE OF CALIBRATION

Certificate No. : CL-003-65

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : Tisch Environmental, Inc.  
**MODEL/TYPE** : TE-5025A  
**SERIAL NUMBER** : 3385  
**ID NUMBER** : UAE-EFM.063/2560  
**CONDITION AS-RECEIVED** : Used item  
**CUSTOMER** : United Analyst and Engineering Consultant Co.,Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,  
Bangkok 10260

**RECEIVED DATE** : 15 Jul 2022  
**MEASUREMENT DATE** : 25 Jul 2022  
**ISSUE DATE** : 26 Jul 2022

### ENVIRONMENTAL CONDITIONS:

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

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 24.8 °C and 55.1 %RH.

### TABULATION OF RESULTS:

The table on next page give the measured values.

**Calibration procedure:**  
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/(MCG/N24dp). The We-CI-004 was used as a calibration guideline.

**Traceability:**  
This certificate provides a traceability of The measurement to recognized the national standards and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: G2211501

**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"

Table 1: The results of Q Standard calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH <sub>2</sub> O	γ	Standard Flow [Qs] m <sup>3</sup> /min
1	0.697	754.265	24.640	23.960	55.399	1.699	1.299	0.643
2	1.000	754.236	24.950	24.350	62.172	3.444	1.849	0.913
3	1.118	754.323	24.730	24.210	41.925	4.582	2.133	1.051
4	1.169	754.212	24.640	24.160	31.045	5.150	2.262	1.116
5	1.416	754.175	24.480	24.210	30.117	7.629	2.754	1.353

Slope (m): 2.04804  
Intercept (b): -0.01939  
Correlation coefficient (r): 0.99982  
Uncertainty (k=2): 0.011 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 [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH <sub>2</sub> O	γ	Standard Flow [Qs] m <sup>3</sup> /min
1	0.697	754.265	24.640	23.960	55.399	1.699	0.819	0.647
2	1.000	754.236	24.950	24.350	62.172	3.444	1.167	0.919
3	1.118	754.323	24.730	24.210	41.925	4.582	1.345	1.058
4	1.169	754.212	24.640	24.160	31.045	5.150	1.426	1.123
5	1.416	754.175	24.480	24.210	30.117	7.629	1.735	1.361

Slope (m): 1.28277  
Intercept (b): -0.01223  
Correlation coefficient (r): 0.99982  
Uncertainty (k = 2): 0.012 m<sup>3</sup>/min

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

Calibrated by:

☐ Mr. [REDACTED]  
☒ Ms. [REDACTED]



Approved signatory: [REDACTED]

Calibration Department Manager



THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS IN WRITING FROM 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. 0-2717-3000-24 FAX. 0-2719-9484

## Certificate of Calibration

Certificate No. : 24P1250  
Page : 1 of 2

**Equipment :** U Tube Manometer  
**Manufacturer:** Dwyer  
**Model :** 1221-36-W/M  
**Serial No.:** -  
**ID No.:** UAE.EFM.076/2566

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

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

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

### Condition of this result of calibration

1.Reference standards instruments :

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

- This result of calibration was made on requested at the point specified by customer.
- Scale and conversion factor is 1 kPa = 4.0146293 inH<sub>2</sub>O
- This instrument was used clean air as pressure media.
- This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.
- This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certificate is traceable to the International System of Unit maintained through:-  
-National Institute of Metrology (Thailand), NSC-ONSC Accredited No, Calibration 0144

Calibrated by : [REDACTED]  
Issue Date : 17 April 2024

Approved Signatory : [REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]

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

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

**Range :** 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>O  
**Scale Interval:** 0.1 inH<sub>2</sub>O ( The Second Estimate )

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

The uncertainty of measurement was ± 0.11 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

Certificate No. : 24P1367  
Page : 1 of 2

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

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

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

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

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

### Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

### Function:- Absolute Pressure Measurement

Scale Interval : 1 hPa ( The Fifth Estimate )

#### Increasing Pressure

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

#### Decreasing Pressure

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

The uncertainty of measurement was ± 0,25 hPa

\* UUC = Unit Under Calibration

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

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Calibrated by :   
Issue Date : 23 April 2024

Approved Signatory :

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## Certificate of Calibration

Certificate No. : 24H756  
Page : 1 of 2

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

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

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

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

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 20058240

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

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

### Result of Calibration:-

Without Adjustment

### Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25,0	40,1	44	3,9	1,6
25,0	60,0	61	1,0	1,7
25,0	80,0	76	-4,0	1,8

### Result of Calibration:-

Without Adjustment

### Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20,007	20,5	0,493	0,72
25,032	25,0	-0,032	0,72
29,997	30,0	0,003	0,72
35,010	34,5	-0,510	0,72
40,019	39,5	-0,519	0,72

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied  
by coverage factor  $k = 2,00$ , providing confidence level approximately 95%.

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Calibrated by :   
Issue Date : 18 April 2024

Approved Signatory :

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### MULTI-POINT GAS TEST REPORT

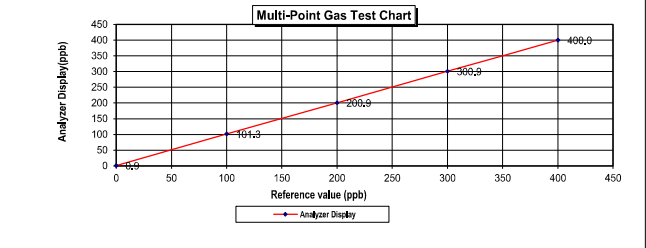
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>)      Model : 42i  
Manufacturer : Thermo Scientific      Serial Number : CM08130002

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

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90	0.90
Level 2	20.00%	100.0	101.3	1.30	1.28	1.28
Level 3	40.00%	200.0	200.9	0.90	0.45	0.45
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.59



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### MULTI-POINT GAS TEST REPORT

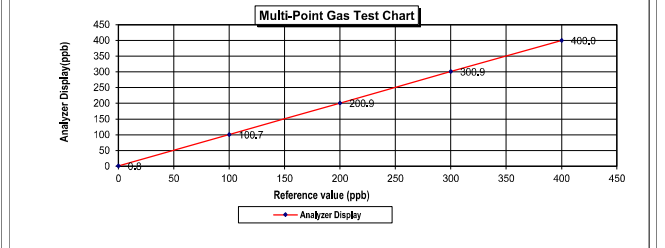
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>)      Model : 42i  
Manufacturer : Thermo Scientific      Serial Number : CM19050148

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

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.80	0.80	0.80
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.9	0.90	0.45	0.45
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.45



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### MULTI-POINT GAS TEST REPORT

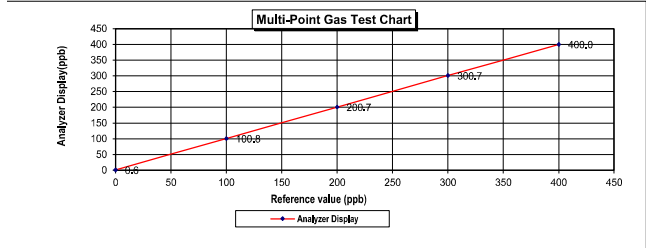
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>)      Model : 42i  
Manufacturer : Thermo Scientific      Serial Number : CM19050149

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

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.60	0.60	0.60
Level 2	20.00%	100.0	100.8	0.80	0.79	0.79
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.40	



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01 / Nov / 2023      01 / Nov / 2023

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)  
LTD  
Part Number: E05N191E15A0014      Reference Number: 160-402772205-1  
Cylinder Number: EB0162121      Cylinder Volume: 144.0 CF  
Laboratory: 124 - Plumsteadville - PA      Cylinder Pressure: 2016 PSIG  
PGVP Number: A12023      Valve Outlet: 660  
Gas Code: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, BALN      Certification Date: Jul 06, 2023  
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 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, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913680	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340502002	EB0136037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	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	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025
The STRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration			
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023			
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023			
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023			
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023			
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023			

### MULTI-POINT GAS TEST REPORT

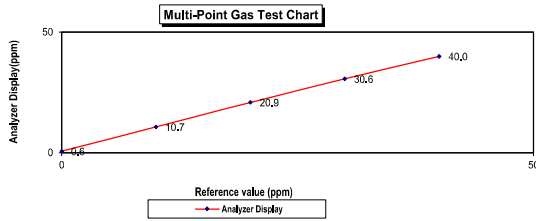
Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : APMA-370  
Manufacturer : HORIBA Serial Number : YRLHTB7G

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

#### Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.6	0.6	0.6
Level 2	20.00%	10.0	10.7	0.7	6.5	6.5
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.6	0.6	2.0	2.0
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)			2.68



Calculated by :  
.....8...../.....12...../.....2023  
Approved by :  
.....8...../.....Dec...../.....2023

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เอกสารไม่ควบคุม

### MULTI-POINT GAS TEST REPORT

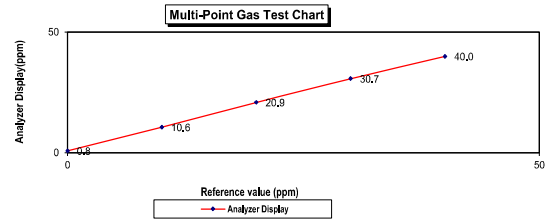
Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C  
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-65506-348

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

#### Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.8	0.8	0.8	0.8
Level 2	20.00%	10.0	10.6	0.6	5.7	5.7
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)			2.61



Calculated by :  
.....8...../.....12...../.....2023  
Approved by :  
.....8...../.....Dec...../.....2023

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เอกสารไม่ควบคุม

### MULTI-POINT GAS TEST REPORT

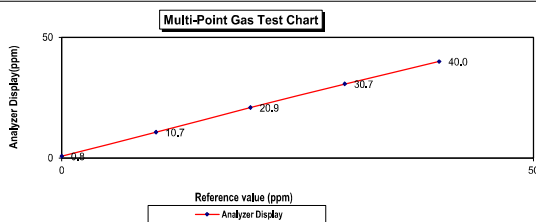
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : CM08140004

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

#### Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.8	0.8	0.8
Level 2	20.00%	10.0	10.7	0.7	6.5	6.5
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)			2.79



Calculated by :  
.....13...../.....11...../.....2023  
Approved by :  
.....13...../.....Nov...../.....2023

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เอกสารไม่ควบคุม

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

LTD

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, 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)531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913680	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340502002	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	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	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025
The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet iS50 FTIR AUP2010245 CO2	FTIR		Jun 15, 2023		
SIEMENS ULTRAMAT6E N1-C8-180	NDIR		Jun 14, 2023		
Nicolet iS50 FTIR AUP2010245 NO	FTIR		Jun 29, 2023		
Nicolet iS50 FTIR AUP2010245 NO2	FTIR		Jun 15, 2023		
Nicolet iS50 FTIR AUP2010245 SO2	FTIR		Jun 08, 2023		

Approved for Release

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List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Andersen Instruments, Inc.	G25A 11MX	Jiranatee Associates Co., Ltd.	CO-005-66	12 Jun 23	11 Jun 25	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H750	10 Apr 24	9 Apr 25	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM22387039	UAE Consultant Co.,Ltd.	07112023	7 Nov 23	6 Nov 24	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM22387040	UAE Consultant Co.,Ltd.	07112023	7 Nov 23	6 Nov 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Environmental Instrument	42C 42C-67174-356	UAE Consultant Co.,Ltd.	01112023	1 Nov 23	31 Oct 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-71185-368	UAE Consultant Co.,Ltd.	18122023	18 Dec 23	17 Dec 24	-
10	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200636467	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200906880	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
12	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31	-
13	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	24-ACT-086	25 Jun 24	24 Jun 25	-
14	Sound Level Meter	L <sub>Aeq</sub> 1 hours, L <sub>Aeq</sub> 24 hrs, L <sub>Amax</sub> , L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument	24-SLM-235	10 Jul 24	9 Jul 25	-
				0005346	Co.,Ltd.				



List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
15	Sound Level Meter	L <sub>Aeq</sub> 1 hours, L <sub>Aeq</sub> 24 hrs, L <sub>Amax</sub> , L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument Co.,Ltd.	24-SLM-237	10 Jul 24	9 Jul 25	-
				0005393					
16	Sound Level Meter	L <sub>Aeq</sub> 1 hours, L <sub>Aeq</sub> 24 hrs, L <sub>Amax</sub> , L <sub>A90</sub>	Larson Davis	LxT2	Innovative Instrument Co.,Ltd.	24-SLM-214	2 Jul 24	1 Jul 25	-
				0005398					

## CERTIFICATE OF CALIBRATION

Certificate No. : CO-005-66

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : Andersen Instruments  
**MODEL/TYPE** : G25A  
**SERIAL NUMBER** : 11MX  
**ID NUMBER** : UAE.ANV.008/2543  
**CONDITION AS-RECEIVED** : Used item  
**CUSTOMER** : United Analyst and Engineering Consultant Co.,Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,  
Bangkok 10260

**RECEIVED DATE** : 02 Jun 2023  
**MEASUREMENT DATE** : 12 Jun 2023  
**ISSUE DATE** : 12 Jun 2023

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 24.0 °C and 56.4%RH.

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

### TABULATION OF RESULTS:

The table on next page give the measured values.

**Calibration procedure:**  
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The Wt-GL-004 was used as a calibration guideline.

**Traceability:**  
This certificate provides a traceability of The measurement to recognized the national standards and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

**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 [Ta] °C	Temperature [Tm] °C	Δp_meter mmHg	Δp_Orifice inH <sub>2</sub> O	γ	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	754.535	24.09	23.49	51.470	1.745	1.318	0.656
2	0.998	754.592	24.01	23.68	55.777	3.453	1.855	0.922
3	1.124	754.473	23.93	23.53	37.502	4.619	2.145	1.066
4	1.172	754.436	23.39	23.00	27.960	5.187	2.275	1.128
5	1.418	754.502	23.52	23.02	28.014	7.616	2.756	1.365

Slope (m): 2.02897  
Intercept (b): -0.01391  
Correlation coefficient (r): 0.99986  
Uncertainty (k=2): 0.015 m<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 [Ta] °C	Temperature [Tm] °C	Δp_meter mmHg	Δp_Orifice inH <sub>2</sub> O	γ	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.705	754.535	24.09	23.49	51.470	1.745	0.829	0.658
2	0.998	754.592	24.01	23.68	55.777	3.453	1.166	0.925
3	1.124	754.473	23.93	23.53	37.502	4.619	1.349	1.070
4	1.172	754.436	23.39	23.00	27.960	5.187	1.428	1.130
5	1.418	754.502	23.52	23.02	28.014	7.616	1.730	1.368

Slope (m): 1.27084  
Intercept (b): -0.00875  
Correlation coefficient (r): 0.99986  
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

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



Calibrated by:

Approved signatory:

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



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

## Certificate of Calibration

Certificate No. : 24P1250  
Page : 1 of 2

**Equipment :** U Tube Manometer  
**Manufacturer:** Dwyer  
**Model :** 1221-36-W/M  
**Serial No.:** -  
**ID No.:** UAE.EFM.076/2566

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

**Reference:** 2404-0118WSC  
**Ambient Temperature:** ( 23 ± 2 ) °C  
**Relative Humidity:** ( 50 ± 15 ) %  
**Atmospheric Pressure:** 1007 mbar  
**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 :   
Issue Date : 17 April 2024

Approved Signatory :

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

**Range :** 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>O  
**Scale Interval :** 0.1 inH<sub>2</sub>O ( The Second Estimate )

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

The uncertainty of measurement was ± 0.11 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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Cert.No.: 24P1250  
Page: 2 of 2

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## Certificate of Calibration

Certificate No. : 24P1367  
Page : 1 of 2

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

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

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

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

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by :   
Issue Date : 23 April 2024

Approved Signatory :

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

### Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range : 960 hPa to 1030 hPa

Scale Interval : 1 hPa ( The Fifth Estimate )

#### Increasing Pressure

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

#### Decreasing Pressure

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

The uncertainty of measurement was ± 0,25 hPa

\* UUC = Unit Under Calibration

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

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## Certificate of Calibration

Certificate No. : 24H750  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer  
Manufacturer: Barigo  
Model : -  
Serial No.: -  
ID No.: UAE,ANV,001/2548

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

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

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

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 20058240

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

Calibrated by :   
Issue Date : 18 April 2024

Approved Signatory :

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### Result of Calibration:-

Function: Humidity Measurement.

Without Adjustment

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25,0	40,1	40	-0,1	1,6
25,0	60,0	60	0,0	1,7
25,0	80,0	81	1,0	1,8

### Result of Calibration:-

Function: Temperature Measurement.

Without Adjustment

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20,014	21,0	0,986	0,72
25,033	25,0	-0,033	0,72
30,010	29,5	-0,510	0,72
35,027	34,0	-1,027	0,72
40,013	38,5	-1,513	0,72

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor  $k = 2,00$ , providing confidence level approximately 95%.

-000-

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### MULTI-POINT GAS TEST REPORT

Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : CM22387039

#### Standard Gas Concentration

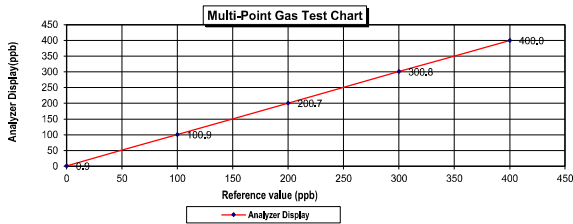
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 21, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.9	0.90	0.90	0.90
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb		Average Difference (%) 0.48	



07 / Nov / 2023

08 / Nov / 2023

### MULTI-POINT GAS TEST REPORT

Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : CM22387040

#### Standard Gas Concentration

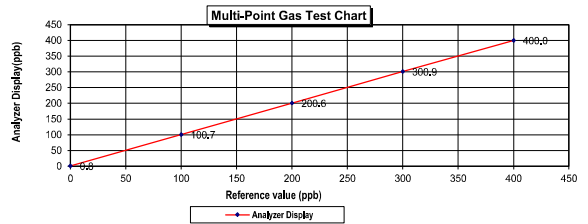
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 21, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.8	0.80	0.80
Level 2	20.00%	100.0	100.7	0.70	0.70
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 (%)		0.42



07 / Nov / 2023

08 / Nov / 2023

### MULTI-POINT GAS TEST REPORT

Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42C  
Manufacturer : Thermo Environmental Instruments Serial Number : 42C- 67174-356

#### Standard Gas Concentration

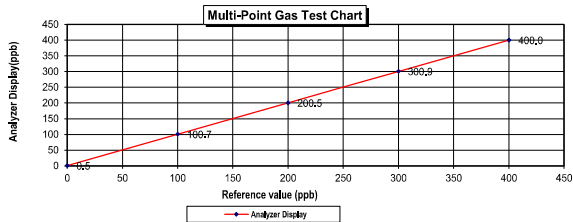
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 21, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.5	0.50	0.50	0.50
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.5	0.50	0.25	0.25
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.35



01 / Nov / 2023

1 / Nov / 2023

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, 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-12/231, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913680	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340502002	EB0136037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC754902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025
The STRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration			
Nicolet IS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023			
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023			
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023			
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023			
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023			

### MULTI-POINT GAS TEST REPORT

Test Date : Dec 18, 2023

Equipment : Gas Analyzer (CO) Model : 48C  
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-71185-368

#### Standard Gas Concentration

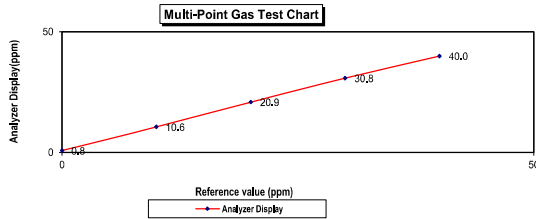
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 20, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.8	0.8
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.9	0.9	4.3
Level 4	60.00%	30.0	30.8	0.8	2.6
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		2.67
:Acceptable Limit $\pm$ 5%					



Calculate by

18/12/2023

Approved by

18/Dec/2023

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### MULTI-POINT GAS TEST REPORT

Test Date : Nov 13, 2023

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

#### Standard Gas Concentration

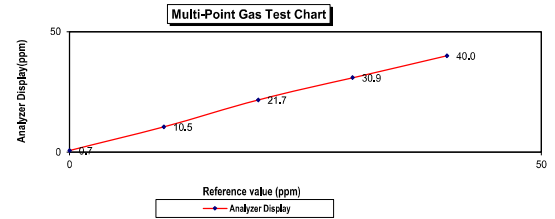
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 20, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.5	0.5	4.8
Level 3	40.00%	20.0	21.7	1.7	7.8
Level 4	60.00%	30.0	30.9	0.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		3.24
:Acceptable Limit $\pm$ 5%					



Approve by

13/Nov/2023

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### MULTI-POINT GAS TEST REPORT

Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1200906880

#### Standard Gas Concentration

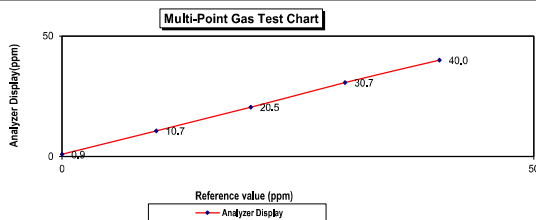
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 20, 2024

#### Dilutor Detail

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

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.9	0.9
Level 2	20.00%	10.0	10.7	0.7	6.5
Level 3	40.00%	20.0	20.5	0.5	2.4
Level 4	60.00%	30.0	30.7	0.7	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		2.43
:Acceptable Limit $\pm$ 5%					



Calculate by

13/Nov/2023

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13/Nov/2023

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INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,  
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: (660-2)116-5860-1 FAX: (660-2)116-7140



### 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-ACT-086  
Request No : Req-2024-1364

#### Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2  
Manufacturer : LARSON DAVIS Range : 94 , 114 dB / 1000 Hz  
Model : CAL150 Instrument Status : Used  
Serial Number : 6171  
ID : UAE.EFM.117/2562

#### Calibration Environment and Details

Temperature : (  $23 \pm 2$  °C )  
Humidity : (  $50 \pm 20$  %RH )  
Barometric Pressure : (  $1013 \pm 10.0$  hPa )  
Received Date : 20 June 2024  
Calibration Date : 25 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	EEL	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. [Signature]  
Service Calibration Engineer

Approved By :

Mr. [Signature]  
Calibration Engineer Supervisor

Issue Date : 25 June 2024

Certificate No : 24-ACT-086

Request No : Req-2024-1364

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty ( ± dB)	Acceptance limit Class 2 ( ± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.99	-0.01	-	-	0.13	0.40	Pass
114 dB / 1000 Hz	114.02	0.02	-	-	0.14	0.40	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty ( ± %)	Acceptance limit Class 2 ( ± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7	Pass
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7	Pass

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty ( ± %)	Acceptance limit Class 2 ( ± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.05	-	0.40	3.0	Pass
114 dB / 1000 Hz	0.30	-	0.40	3.0	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.35 dB
Frequency	0.20%
Total distortion+noise	1.00%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

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

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

Certificate No : 24-ACT-086

Request No : Req-2024-1364

Decision Rule for Statements of Conformity

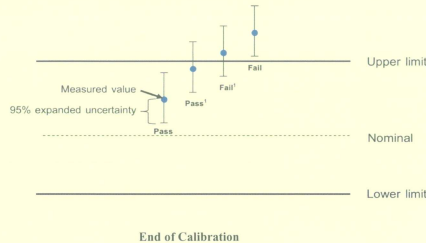
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



End of Calibration

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

เอกสารไม่ควบคุม

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

### 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-SLM-235

Request No : Req-2024-1454

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : Larson Davis  
Model : LX12  
Serial Number : 0005346  
ID : UAE.EFM.043/2563  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375B02  
Microphone S/N : 11798  
Preamplifier Model : PRMLX12B  
Preamplifier S/N : 056138  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 1 July 2024  
Calibrated Date : 10 July 2024  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

#### Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	131	8 October 2024	WK Electric

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

Calibrated By :

Mr. [Redacted]  
Service Calibration Engineer

Approved By :

[Redacted]  
Calibration Engineer Supervisor

Issue Date : 10 July 2024

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-235

Request No : Req-2024-1454

#### 1. Indication at the calibration check frequency

UUC Setting FAST / A / 37-139	Nominal	Before Adjust		After Adjust		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)	Result
	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting	(dB)							
1000 Hz 114 dB	113.76	115.3	1.54	113.8	+0.04	0.20	0.30	Pass

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

#### 2. Self-generated noise, Microphone installed

UUC Setting FAST / 37-139	Measured (dB)	UNCERTAINTY ( ± dB)
UUC Weighting		
A	31.4	0.10

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

UUC Setting FAST / 37-139	Measured (dB)	UNCERTAINTY ( ± dB)
UUC Weighting		
A	31.1	0.10
C	30.5	0.10
Z	35.0	0.10

#### 4. Acoustic signal test of frequency weightings

(Without Windscreen)

UUC Setting FAST / 37-139	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)	Result
	STD Setting (dB)	A (dB)	C (dB)			
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	1.1	1.1	1.1	0.60	3.0	Pass
8000 Hz	2.6	2.5	2.6	0.70	5.0	Pass

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24



Certificate No : 24-SLM-235  
Request No : Req-2024-1454

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance	Result
FAST / 37-139	Weighting Response curve				Limit	
STD Setting	A (dB)	C (dB)	Z (dB)	( ± dB)	( ± dB)	
63 Hz	-0.1	0.0	0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	-0.1	0.0		3.0	Pass
8000 Hz	-0.1	-0.1	0.0		5.0	Pass
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	REF	UUC	ERR			
UUC Weighting	(dB)	(dB)	(dB)	0.20	0.20	Pass
A	114.00	114.0	0.0			
C	114.00	114.0	0.0			
Z	114.00	114.0	0.0			

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A	REF	UUC	ERR			
UUC Time Response	(dB)	(dB)	(dB)	0.20	0.10	Pass1
Fast	114.00	114.0	0.0			
Slow	114.00	114.0	0.0			
Leq	114.00	114.0	0.0			

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of **เอกสารไม่ควบคุม**  
FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-235  
Request No : Req-2024-1454

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	0.10	0.30	Pass
Initial	114.0			
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	0.30	1.1	Pass
139.00	139	139.0	0.0			
134.00	134	134.0	0.0			
129.00	129	129.0	0.0			
124.00	124	124.0	0.0			
119.00	119	119.0	0.0			
114.00	114	114.0	0.0			
109.00	109	109.0	0.0			
104.00	104	104.0	0.0			
99.00	99	99.0	0.0			
94.00	94	94.0	0.0			
89.00	89	89.0	0.0			
84.00	84	84.0	0.0			
79.00	79	79.0	0.0			
74.00	74	74.0	0.0			
69.00	69	69.0	0.0			
64.00	64	64.0	0.0			
59.00	59	59.0	0.0			
54.00	54	54.0	0.0			
49.00	49	49.1	0.1			
44.00	44	44.2	0.2			
43.00	43	43.3	0.3			
42.00	42	42.3	0.3			
41.00	41	41.4	0.4			

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-235  
Request No : Req-2024-1454

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A	REF	UUC	ERR			
UUC Range	(dB)	(dB)	(dB)	0.30	1.1	Pass
37-139	46.40	46.5	0.1			
	114	114.0	0.0			

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 37-139	Toneburst	Ref	UUC	ERR			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.20	1.0	Pass
Fast	200	135.0	134.9	-0.1			
	2	118.0	117.6	-0.4			
	0.25	109.0	108.5	-0.5			
Slow	200	128.6	128.4	-0.2			
	2	109.0	108.8	-0.2			
	200	129.0	129.0	0.0			
SEL	2	109.0	108.8	-0.2			
	0.25	100.0	99.7	-0.3			

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / C / 95-142	REF	UUC	ERR			
STD Setting	(dB)	(dB)	(dB)	0.20	2.0	Pass
Complete cycle	137.4	136.8	-0.60			
Positive half cycle	136.4	136.2	-0.20			
Negative half cycle	136.4	136.2	-0.20			

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-235  
Request No : Req-2024-1454

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	0.20	1.5	Pass
Positive one-half cycle	145.4			
Negative one-half cycle	145.3			
Deviated	0.1			

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	0.10	0.30	Pass
Initial	138.0			
Final	138.0			
Deviated	0.0			

Note :

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

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24





7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	( ± dB)	( ± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	( ± dB)	( ± dB)	
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.1	0.1		1.1	Pass
39.00	39	39.4	0.4		1.1	Pass
38.00	38	38.5	0.5		1.1	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UUC	ERR			
UUC Range	(dB)	(dB)	(dB)	( ± dB)	( ± dB)	
37-139	43.80	43.9	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
A / 37-139	Toneburst	Ref	UUC	ERR			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	( ± dB)	( ± dB)	
Fast	200	135.0	134.9	-0.1	0.20	1.0	Pass
	2	118.0	117.9	-0.1		+1.0, -2.5	Pass
	0.25	109.0	108.7	-0.3		+1.5, -5.0	Pass
Slow	200	128.6	128.4	-0.2		1.0	Pass
	2	109.0	108.8	-0.2		+1.0, -5.0	Pass
SEL	200	129.0	129.0	0.0		1.0	Pass
	2	109.0	109.1	+0.1		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / C / 95-142	REF	UUC	ERR			
STD Setting	(dB)	(dB)	(dB)	( ± dB)	( ± dB)	
Complete cycle	137.4	136.8	-0.60	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	( ± dB)	( ± dB)	
Positive one-half cycle	142.6			
Negative one-half cycle	142.6			
Deviated	0.0	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	( ± dB)	( ± dB)	
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	0.30	Pass

Note :

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

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Decision Rule for Statements of Conformity

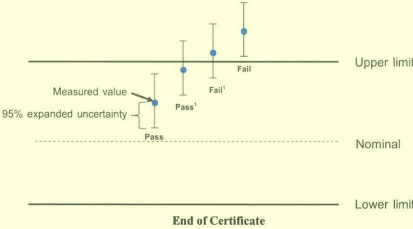
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of **เอกสารไม่ควบคุม**  
FM-708-SLM-01 Rev.04 Issue date 5/6/24



Certificate of Calibration

Customer

Name

: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Certificate No : 24-SLM-214

Address

: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Request No : Req-2024-1379

Unit Under Calibration Details

Measurement item

: Sound Level Meter

Microphone Class : 2

Manufacturer

: Larson Davis

Microphone Model : 375A04

Model

: LxT2

Microphone S/N : 328675

Serial Number

: 0005398

Preamplifier Model : PRMLxT2C

ID

: UAE.EFM.035/2564

Preamplifier S/N : 073793

Resolution

: 0.1 dB

Instrument Status : Used

Calibration Environment and Details

Temperature

: 23 °C ± 2 °C

Humidity

: 50 %RH ± 20 %RH

Barometric Pressure

: 1013 hPa ± 10 hPa

Received Date

: 24 June 2024

Calibrated Date

: 2 July 2024

Calibration Procedure

: In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration

: Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Tracebility
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	131	8 October 2024	WK Electric

Note

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

Calibrated By :

Service Calibration Engineer

Approved By :

Calibration Engineer Supervisor

Issue Date :




2 July 2024

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เอกสารไม่ควบคุม

FM-708-SLM-01 Rev.04 Issue date 5/6/24

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7/139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAEO,  
AMPHOE BANG PHI SAMUT PRAKAN PROVINCE 10540 THAILAN  
TEL: 6690-2116-5860-1 FAX: 6690-2116-7140



Page : 2/7.

Certificate No : 24-SLM-214

Request No : Req-2024-1379

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)	Limit	Pass
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)	
1000 Hz 114 dB	113.76	114.0	0.24	113.8	+0.04	0.20	0.30	Pass

Note :

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.1	0.10
C	27.9	0.10
Z	32.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance	Result
FAST / 37-139	A	C	Z	(± dB)	Limit	
STD Setting	(dB)	(dB)	(dB)		(± dB)	
125 Hz	-0.1	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.6	0.6	0.60	3.0	Pass
8000 Hz	0.5	0.4	0.4	0.70	5.0	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-214

Request No : Req-2024-1379

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance	Result
FAST / 37-139	A	C	Z	(± dB)	Limit	Pass
STD Setting	(dB)	(dB)	(dB)		(± dB)	
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.0	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.1	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.1		3.0	Pass
8000 Hz	0.0	0.0	0.1		5.0	Pass
16000 Hz	0.0	0.0	-0.1		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / 37-139	REF	UUC	ERR	(± dB)	Limit	Pass
UUC Weighting	(dB)	(dB)	(dB)		(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
37-139 / A	REF	UUC	ERR	(± dB)	Limit	Pass
UUC Time Response	(dB)	(dB)	(dB)		(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Leq	114.00	114.0	0.0		0.10	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-214

Request No : Req-2024-1379

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit	Pass
STD Setting	(dB)		(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	REF	UUC	ERR	(± dB)	Limit	Pass
STD dB	(dB)	(dB)	(dB)		(± dB)	
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
89.00	89	88.9	-0.1		1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
79.00	79	78.9	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
69.00	69	68.9	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
59.00	59	58.9	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.3	0.3		1.1	Pass
38.00	38	38.4	0.4		1.1	Pass

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เอกสารไม่ควบคุม

FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-214  
Request No : Req-2024-1379

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)	
37-139	43.60	43.7	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
A / 37-139	Toneburst	Ref	UUC	ERR		Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.8	-0.2		+1.0, -2.5	Pass
	0.25	109.0	108.6	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
FAST / C / 95-142	REF	UUC	ERR		Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	137.4	136.7	-0.70	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-214  
Request No : Req-2024-1379

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Positive one-half cycle	142.0			
Negative one-half cycle	142.1			
Deviated	-0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	0.30	Pass

Note :

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

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-214  
Request No : Req-2024-1379

Decision Rule for Statements of Conformity

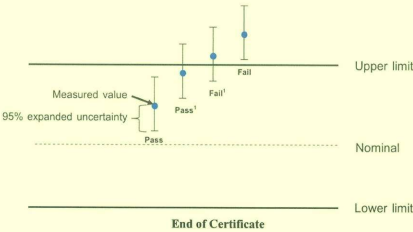
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

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

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

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

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



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เอกสารไม่ควบคุม

FM-708-SLM-01 Rev.04 Issue date 5/6/24

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUA-PH210 HA1M0036	Technology Promotion Association (Thailand-Japan)	24CH240	20 Feb 24	19 Feb 25	-
2	DO Meter	DO	Horiba	LAQUA-DO210 HE9M0004	Technology Promotion Association (Thailand-Japan)	24TW36	20 Feb 24	19 Feb 25	-





Cert.No.: 24CH240  
Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH210  
Serial No. : HA1M0036  
ID No. : UAE.EFM.012/2565(EFM.pH.02/65)  
Condition As-Received: Used Item  
Received Date : 19 February 2024  
Calibration Date : 20 February 2024  
Reference : 2402-0594WSC-4  
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 :   
Approved by :   
Approved Signatory

( )   
( )   
(✓) 

Issue Date : 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0063842



Cert.No.: 24CH240  
Page.: 2 of 3

### Condition of this calibration result

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

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

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	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 certification 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.: HA1M0036	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

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a 1203290



Cert.No.: 24CH240  
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.: Q92M0181	4.008	4.01	177.8	0.0071	2.00
	6.986	6.99	2.5	0.0099	2.00
	6.986	6.99	1.8	0.0099	2.00
	9.997	10.00	-169.3	0.0095	2.00

#### Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9625-10D  
- Serial No. : Q92M0181  
Dimension of probe  
- Length : 107 mm.  
- Diameter : 16 mm.  
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	0.13	2.00

Remark - UUC\* = Unit Under Calibrator

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

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a 1203289



Cert.No.: 24TW36  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : Horiba  
Model : LAQUA-DO210  
Serial No. : HE9M0004  
ID No. : UAE.EFM.012/2563 (EFM.DO.01/63)  
Received Date : 19 February 2024  
Test Date : 20 February 2024  
Reference : 2402-0592WSC-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 Sirinthean

Approved by : 

( )   
(✓) 

Issue Date : 23 February 2024

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B 0335182



Cert.No.: 24TW36  
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.: 9K2B0019

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0045

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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a 1203168



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.: 24LM20  
Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with sensor  
**Manufacturer :** Horiba  
**Model :** LAQUA-DO210  
**Serial No. :** HE9M0004  
**ID No. :** UAE.EFM.012/2563(EFM.DO.01/63)  
**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** TPA On Site Calibration Laboratory  
**Received Order :** 19 February 2024  
**Calibrated Date :** 21 February 2024  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**AC Line Voltage :** ( 220 ± 22 ) V  
**Calibrated by :** [Redacted]  
**Approved by :** [Redacted]  
( ) [Redacted]  
( ) [Redacted]  
(✓) [Redacted]  
**Issue Date :** 23 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.

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A 0063877



**Equipment :** DO Meter with sensor  
**Condition As-Received :** Used Item  
**Reference :** 2402-0592WSC-2

Cert. No.: 24LM20  
Page.: 2 of 2

#### Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument-  

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2186080	231216	TPA	11 Oct 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

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

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

**Function :** Temperature measurement.  
This instrument was connected with temperature sensor, S/N.: 9K2B0019

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
25.0	90	25.002	25.0	-0.002	0.16	2.00
30.0	90	30.002	30.0	-0.002	0.16	2.00
35.0	90	35.003	35.0	-0.003	0.16	2.00

UUC\* : Unit Under Calibration

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

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a 1202946

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Air Quality Analysis									
1	Analytical Balance (Readability 0.1 mg)	ฝุ่นละอองรวม (TSP) ฝุ่นละอองขนาดไม่เกิน 10 ไมครอน (PM10)	Mettler-Toledo	AB204-S/FACT / B108115858	National Food Institute, Ministry of Industry, Thailand	<u>2402420-001-01</u>	19 Apr 24	18 Apr 25	-
2	UV-VIS Spectrophotometer	ก๊าซไนโตรเจนไดออกไซด์ (NO2)	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	<u>SP24-018</u>	9 May 24	8 May 25	-
Equipment for Water Quality Analysis									
3	pH Meter	ค่าความเป็นกรด-ด่าง (pH) ค่าอุณหภูมิ (Temperature)	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	<u>2401718-001-01</u>	11 Mar 24	10 Mar 25	-
4	BOD Incubator	ความสกปรกในรูปบีโอดี (Biochemical Oxygen Demand)	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	<u>24TM303</u>	10 Feb 24	9 Feb 25	-
5	DO Meter		YSI	5100 / 11B101863	Technology Promotion Association (Thailand-Japan)	<u>24TW39</u>	21 Feb 24	20 Feb 25	-
6	Analytical Balance (Readability 0.1 mg)	น้ำมันและไขมัน (Oil and Grease)	Mettler-Toledo	XSR204 / C117635043	Technology Promotion Association (Thailand-Japan)	<u>24MM293</u>	11 May 24	10 May 25	-
7	Analytical Balance (Readability 0.01 mg)	ปริมาณของแข็งแขวนลอยทั้งหมด (Total Suspended Solids) ของแข็งละลายน้ำทั้งหมด (Total Dissolved Solids)	Mettler-Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	<u>2402283-002-01</u>	2 Apr 24	1 Apr 25	-
8	Hot Air Oven		Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	<u>24TM589</u>	1 Apr 24	31 Mar 25	-
9	UV-VIS Spectrophotometer	ไนเตรตในหน่วยไนโตรเจน (Nitrare-Nitrogen)	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	<u>SP24-018</u>	7 May 24	6 May 25	-



List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Water Quality Analysis									
10	Incubator	โคลิฟอร์มแบคทีเรียทั้งหมด (Total Coliform Bacteria) แพลงก์ตอน (plankton)	Binder	KB400 / 20200000015535	Technology Promotion Association (Thailand-Japan)	<u>24TM647</u>	1 Apr 24	31 Mar 25	-
11	Incubator		Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	<u>24TM650</u>	2 Apr 24	1 Apr 25	-
12	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	<u>24TM29</u>	10 Feb 24	8 Feb 25	-
13	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	<u>24TM30</u>	10 Feb 24	8 Feb 25	-
14	Auto Clave		ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	<u>2402281-001-01</u>	2 Apr 24	1 Apr 25	-
15	Auto Clave		ALP	CL-40L / 810010	Technology Promotion Association (Thailand-Japan)	<u>24TM835</u>	7 Jun 24	6 Jun 25	-
16	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	<u>C01234158</u>	7 Dec 23	6 Dec 24	-

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

## Calibration Certificate

**Certificate No.:** 2402420-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** AB204-S/FACT  
**Serial No.:** B108115858  
**ID No.:** UAE.AIR.016/2555  
**Order No.:** 2402420  
**Operation No.:** 2402420-001  
**Date of Receipt:** 19 April 2024  
**Date of Calibration:** 19 April 2024

**Calibrated by** Mr. [REDACTED] **Approved by** [REDACTED]  
Scientist (M) Vice President, Department of Laboratory Services  
Responsible for the Technical Management Team  
**Date of Issue:** 23 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.:** 2402420-001-01  
**Equipment:** Electronic Balance  
**Model:** AB204-S/FACT  
**Serial No.:** B108115858  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.AIR.016/2555

Page 2 of 3

**Date of Calibration:** 19 April 2024  
**Environment Condition:** Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %  
**Place of Calibration:** Room 206 Balance Room 2, 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	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 019/23	Quality Reborn	QR24-0492	4 March 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.

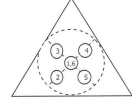
### Calibration Results:

#### 1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.000057
200	0.000079

#### 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 )
99.9999	99.9997	99.9996	99.9998	100.0000	99.9998	0.0003

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

## Calibration Report

**Certificate No.:** 2402420-001-01  
**Equipment:** Electronic Balance  
**Model:** AB204-S/FACT  
**Serial No.:** B108115858  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.AIR.016/2555

**Date of Calibration:** 19 April 2024 **Page 3 of 3**

### Calibration Results: (Continued)

**Calibration Range:** 0-200 g

**Calibration Adjustment:** Internal Calibration

#### 3. Departure from Nominal Value:

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000089	2.00
0.1	0.10000	0.1000	0.0000	0.000089	2.00
1	0.99998	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000091	2.00
10	10.00002	10.0001	-0.0001	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0000	0.0000	0.00012	2.00
70	70.00000	69.9999	0.0001	0.00016	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00022	2.00
200	200.00001	199.9995	0.0005	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

## CERTIFICATE OF CALIBRATION

**Certificate No. :** SP24-018 **Page 1 of 5**

**Customer :** United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

**Location of calibration :** Laboratory 315

**Equipment :** UV-Vis Spectrophotometer

**Manufacturer :** Agilent Technologies

**Model :** Cary 60

**Serial No. :** MY15410009

**ID No. :** UAE.WAT.020/2558

**Received Date :** 7 May 2024

**Calibration Date :** 7 May 2024

**Issue Date :** 9 May 2024

**Condition Instrument :** Good

**Calibrated by :** [REDACTED] **Approved by :** [REDACTED]  
Technical Manager Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

DQEServices

DQE Services Co.,Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

MSC

MSC-TS1-17025

CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National - Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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DQEServices

DQE Services Co.,Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

MSC

MSC-TS1-17025

CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5780	0.5747	0.0033	0.0031	2.00
	1.0484	1.0438	0.0046	0.0029	2.00
	2.1876	2.1832	0.0044	0.0080	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5595	0.5581	0.0014	0.0034	2.00
	1.0239	1.0231	0.0008	0.0035	2.00
	2.1230	2.1219	0.0011	0.0080	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5230	0.5184	0.0046	0.0030	2.00
	0.9633	0.9614	0.0019	0.0029	2.00
	1.9753	1.9731	0.0022	0.0070	2.00
546.1	0.0000	0.0000	0.0000	0.0028	2.00
	0.5181	0.5150	0.0031	0.0031	2.00
	1.0002	0.9964	0.0038	0.0033	2.00
	1.9973	1.9914	0.0059	0.0088	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5517	0.5485	0.0032	0.0030	2.00
	1.0803	1.0772	0.0031	0.0030	2.00
	2.0373	2.0293	0.0080	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5591	0.5565	0.0026	0.0031	2.00
	1.0518	1.0482	0.0036	0.0030	2.00
	1.9274	1.9202	0.0072	0.0079	2.00

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DQEServices

DQE Services Co.,Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

MSC

MSC-TS1-17025

CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0000	0.0000	0.0050	2.00
	0.7469	0.7435	0.0034	0.0057	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8674	0.8639	0.0035	0.0060	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2919	0.2907	0.0012	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6430	0.6402	0.0028	0.0055	2.00

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DQEServices

DQE Services Co.,Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

MSC

MSC-TS1-17025

CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
334.06	333.9	0.16	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.1	0.49	0.18	2.00
445.94	445.6	0.34	0.18	2.00
453.66	453.3	0.36	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	638.7	-0.72	0.18	2.00
431.38	430.8	0.58	0.18	2.00
472.50	472.4	0.10	0.18	2.00
513.47	513.7	-0.23	0.18	2.00
528.88	529.1	-0.22	0.18	2.00
573.17	573.5	-0.33	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	685.1	-0.70	0.18	2.00
740.72	741.4	-0.68	0.20	2.00
748.55	749.1	-0.55	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.3	-0.02	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- \* Indicates non TISI accredited

- End of Certificate -

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## Calibration Certificate

Certificate No.: 2401718-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1231155210  
ID No.: UAE.WAT.010/2553  
Order No.: 2401718  
Operation No.: 2401718-001  
Date of Receipt: 27 February 2024  
Date of Calibration: 11 March 2024

Calibrated by: [Redacted] Approved by: [Redacted]  
Specialist (Mr. [Redacted])  
Manager, Division of Calibration Laboratory  
Date of Issue: 12 March 2024 Responsible for the Technical Management Team

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

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

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

2008 ปีที่ 35 ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110  
2008 Soi 35, Asoen Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10110, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545



## Calibration Report

Certificate No.: 2401718-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1231155210  
Type: Bench top  
ID No.: UAE.WAT.010/2553

Date of Calibration: 11 March 2024 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature: ( 23.4 ± 1.5 ) °C Relative Humidity: ( 51 ± 3 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

1. Calibration Method W-CC-002: In house method based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	23E2003	14 June 2024
2.2 Digital Thermometer	2709007	Fluke	CC 660570-01	30 October 2024
2.3 Thermo-Hygro Meter	NFLBTH 014/23	testo	CC 660353-01	3 April 2024
Certified Reference Material	Lot No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	888842	CPAchem	PH216.L5	13 April 2025
2.5 pH buffer 6.865 (Primary pH buffer Solution)	888843	CPAchem	PH217.L5	13 April 2025
2.6 pH buffer 10.01 (Primary pH buffer Solution)	888844	CPAchem	PH220.L5	13 April 2024
2.7 pH buffer 7.00 (Standard pH buffer Solution)	C03109	HACH LANGE GmbH	S11M004	16 October 2025

3. This certification is traceable to The International System of Unit (SI Unit)

- 3.1 Instruments Ng.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0008  
3.2 Instruments Ng.2.2 and 2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.3 Certified Reference Material Ng.2.4 to 2.6 traceable to Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
3.4 Certified Reference Material Ng.2.7 traceable to PTB Certificate Nr. PTB-PHOA-563/30504/23 and Certificate Nr. PTB-PHOB-565/30620/22 (PTB: Physikalisch-Technische Bundesanstalt, Braunschweig, Germany)

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.

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

2008 ปีที่ 35 ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110  
2008 Soi 35, Asoen Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10110, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

## Calibration Report

Certificate No.: 2401718-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1231155210  
Type: Bench top  
ID No.: UAE.WAT.010/2553

Date of Calibration: 11 March 2024 Page 3 of 5

Calibration Results: 1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (± mV)	Coverage Factor (k)
		mV	pH		
0	414.121	414	0.00	0.58	2.00
2	295.814	296	2.00	0.58	2.00
4	177.464	178	4.00	0.58	2.00
6	59.160	59	6.00	0.58	2.00
7	0.001	0	7.00	0.58	2.00
8	-59.159	-59	8.00	0.58	2.00
10	-177.461	-177	10.00	0.58	2.00
12	-295.811	-296	12.00	0.58	2.00
14	-414.118	-414	14.00	0.58	2.00

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode Type: Combined Electrode  
Manufacturer: METTLER TOLEDO Model: InLab Solids  
Serial No.: 3065701 ID No.: N/A

Performance of Electrode system (Three-Point Calibration at pH 4, 7 and 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	188	-	0.0071	2.00
7.001	7.00	13	98.9	0.0086	2.00
10.010	10.01	-160	97.2	0.0085	2.00
6.865	6.87	21	-	0.0074	2.00

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

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2008 Soi 35, Asoen Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10110, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545



## Calibration Report

Certificate No.: 2401718-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1231155210 ID No.: UAE.WAT.010/2553  
Manufacturer: METTLER TOLEDO

Date of Calibration: 11 March 2024 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature 23 °C ± 1 °C  
Relative Humidity 51 % ± 2 %

Condition of this results of Calibration:

1. Calibration Method : - In house method: W-TE-025 by comparison with standard thermometer.  
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-T 0877/66	06-Jun-24	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

3. This certificate is traceable to International System of Units (SI Units).

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.

6. Condition of Calibrated Item : Good  
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

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

2008 ปีที่ 35 ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110  
2008 Soi 35, Asoen Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10110, Thailand  
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

## Calibration Report

Certificate No.: 2401718-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1231155210 ID No.: UAE.WAT.010/2553  
Manufacturer: METTLER TOLEDO  
Date of Calibration: 11 March 2024 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C  
Calibration result:  
- The probe was immersed in liquid bath or dry bath to a minimum depth of 100 mm.  
- Description of probe, model: N/A S/N: N/A  
Dimension of probe : Diameter 4 mm., Length 120 mm.,  
Sheath material: Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	14.998	0.1	0.099
25.1	24.998	0.1	0.099
35.1	34.997	0.1	0.099

### Note

- UUC\* : Unit Under Calibration

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

----- End -----

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

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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 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 :

Approved by :

Approved Signatory

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) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

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

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



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 Udomsuk 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 :

Approved by :

Approved Signatory

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.

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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 )
	Position									
	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 :-  
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.

Cert. No.: 24TM303  
Page : 2 of 3

#### Condition of this result of calibration

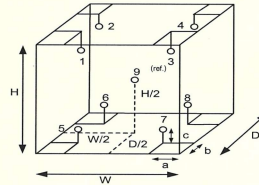
- Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY59003411	23LM208	TPA	27 Dec 2024
- This certificate is valid only to the item calibrated on date and place of calibration.
- 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 )	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

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>

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



## Certificate of Calibration

Cert.No.: 24MM293  
Page.: 1 of 3

Equipment : Electronic Balance  
Manufacturer : Mettler Toledo  
Model : XSR204  
Serial No. : C117635043  
ID No. : UAE.WAS.012/2564  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udumsuk 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 : [Signature]

Approved by : [Signature]  
Approved Signatory

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2405-0166OC-2  
Procedure used :-

Cert.No.: 24MM293  
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

- 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	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
( g )	( g )	( g )	( ± mg )	( k )
100	100.0000	0.0000	0.27	2.03
200	200.0001	-0.0001	0.31	2

After Adjustment :

1. Determination of the standard deviation of weighing machine		( n = 10 )
Applied Weight	Standard Deviation of Reading ( g )	
( g )		
100	0.00007	
200	0.00007	

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## CERTIFICATE OF CALIBRATION

Certificate No. : SP24-018

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : UAE.WAT.020/2558

Received Date : 7 May 2024

Calibration Date : 7 May 2024

Issue Date : 9 May 2024

Condition Instrument : Good

Calibrated by :

Approved by :

Technical Manager

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

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## REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 2 of 5

Environment Condition : Ambient Temperature  $25 \pm 5$  °CRelative humidity  $55 \pm 20$  %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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## REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5780	0.5747	0.0033	0.0031	2.00
	1.0484	1.0438	0.0046	0.0029	2.00
	2.1876	2.1832	0.0044	0.0080	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5595	0.5581	0.0014	0.0034	2.00
	1.0239	1.0231	0.0008	0.0035	2.00
	2.1230	2.1219	0.0011	0.0080	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5230	0.5184	0.0046	0.0030	2.00
	0.9633	0.9614	0.0019	0.0029	2.00
	1.9753	1.9731	0.0022	0.0070	2.00
546.1	0.0000	0.0000	0.0000	0.0028	2.00
	0.5181	0.5150	0.0031	0.0031	2.00
	1.0002	0.9964	0.0038	0.0033	2.00
	1.9973	1.9914	0.0059	0.0088	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5517	0.5485	0.0032	0.0030	2.00
	1.0803	1.0772	0.0031	0.0030	2.00
	2.0373	2.0293	0.0080	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5591	0.5565	0.0026	0.0031	2.00
	1.0518	1.0482	0.0036	0.0030	2.00
	1.9274	1.9202	0.0072	0.0079	2.00

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## REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0000	0.0000	0.0050	2.00
	0.7469	0.7435	0.0034	0.0057	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8674	0.8639	0.0035	0.0060	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2919	0.2907	0.0012	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6430	0.6402	0.0028	0.0055	2.00

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## REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 5 of 5

## Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
334.06	333.9	0.16	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.1	0.49	0.18	2.00
445.94	445.6	0.34	0.18	2.00
453.66	453.3	0.36	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	638.7	-0.72	0.18	2.00
431.38	430.8	0.58	0.18	2.00
472.50	472.4	0.10	0.18	2.00
513.47	513.7	-0.23	0.18	2.00
528.88	529.1	-0.22	0.18	2.00
573.17	573.5	-0.33	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	685.1	-0.70	0.18	2.00
740.72	741.4	-0.68	0.20	2.00
748.55	749.1	-0.55	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.3	-0.02	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- \* Indicates non TISI accredited

- End of Certificate -

เอกสารไม่ควบคุม  
FM-A042-R01-1711-001

## 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 :

Approved by :   
Approved Signatory

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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## Certificate of Calibration

Cert. No.: 24TM650

Page : 1 of 3

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V616.0066

ID No. : UAE.MIC.032/2559

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 : 02 - 03 April 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by :

Approved by :   
Approved Signatory

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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## Certificate of Calibration

Cert. No.: 24TM29

Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0606

ID No. : UAE.MIC.002/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

Location : Microbiology Laboratory

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

Calibrated by :

Approved by :   
Approved Signatory

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.

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2402-0232OC-2

Cert. No.: 24TM29  
Page : 2 of 3

**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

**1. Reference standard instrument:-**

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

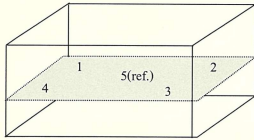
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	51	220
Finished of Calibration	25	50	221



Front

Position :	Ref. Std. ID No.:
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
5(ref.)	N37P301425

เอกสาร



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2402-0232OC-2

Cert. No.: 24TM29  
Page : 3 of 3

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

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

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty  ( ± °C )
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.508	44.469	44.502	44.521	44.527	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor k
44.5	0.15	0.074	2

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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เอกสาร



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.: 24TM30  
Page : 1 of 3

## Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0612

ID No. : UAE.MIC.003/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 10 February 2024

Calibration Date : 10 February 2024

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

Calibrated by :

Approved by :

Approved Signatory

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.

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2402-0232OC-3

Cert. No.: 24TM30  
Page : 2 of 3

**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

**1. Reference standard instrument:-**

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

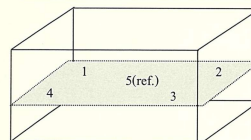
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	24	54	221
Finished of Calibration	26	55	220



Front

Position :	Ref. Std. ID No.:
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
5(ref.)	N37P301425

เอกสาร





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2402-0232OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM30  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty  ( ± °C )
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.6	44.6	44.491	44.463	44.496	44.518	44.528	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor k
44.5	0.12	0.059	2

**Average\*** : The average of 30 values in each position.  
**Uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.  
**UUC\*** : Unit Under Calibration  
**Note** : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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มูลนิธิพัฒนาอุตสาหกรรม  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2402281-001-01  
Equipment: Autoclave  
Model: CL-40L Serial No.: 808763  
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563  
Manufacturer: ALP  
Date of Calibration: 2 April 2024

Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Environment Condition: Ambient Temperature ( 25 ± 1 ) °C  
Relative Humidity ( 55 ± 7 ) %  
Line Voltage ( 225 ± 5 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 3 standard temperature recorder with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1(2021) : Autoclaves for sterilization in laboratories Design, construction, safety and performance Specification.  
- The temperature scale used was based on ITS - 90 .  
- All data show below were final values and the initial data may be obtained upon request.

### 2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	HiTemp140-2	RS4918	TE 660383-01	8 April 2024	NATIONAL FOOD INSTITUTE
	HiTemp140-2	S25601	TE 670033-01	9 November 2024	MADGETECH INC.
	HiTemp140-2	S25602	TE 670034-01	9 November 2024	MADGETECH INC.

3. This certificate is traceable to International System of Units (SI Units).

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.

6. This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.

7. Condition of Calibrated item : Good

UUC Description : Setting program function sterilization : STERILIZE/NORMAL

Time of sterilization 15 Minute At 115.0 aand 121.0 °C

8. Result of Calibration : ☒ Without adjustment  
☐ After adjustment

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

2008 ๒๕๔๘-๒๕๔๙ : 35 หมู่๖ ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10700  
2008 Soi 35, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545



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มูลนิธิพัฒนาอุตสาหกรรม  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: 2402281-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Autoclave  
Manufacturer: ALP  
Model: CL-40L  
Serial No.: 808763  
ID No.: UAE.MIC.026/2563  
Order No.: 2402281  
Operation No.: 2402281-001  
Date of Receipt: 2 April 2024  
Date of Calibration: 2 April 2024

Calibrated by [Redacted] Approved by [Redacted]  
Scientist Manager, Division of Calibration Laboratory  
Date of Issue: 9 April 2024 Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95 %.  
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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



มูลนิธิพัฒนาอุตสาหกรรม  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



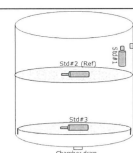
## Calibration Report

Certificate No.: 2402281-001-01  
Equipment: Autoclave  
Model: CL-40L Serial No.: 808763  
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563  
Manufacturer: ALP  
Date of Calibration: 2 April 2024

Calibration point: 115.0 aand 121.0 °C

### Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	24.4	48.6	220
Max	25.5	62.1	230



Standard at Position  
Std#1 = Attached to the load temperature probe, within 20 mm.  
Std#2 = In the upper half of the chamber  
Std#3 = In the chamber drain, within 100 mm.

### Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.2 is REF)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
115.0	115.28	115.35	115.38	0.64
121.0	121.28	121.36	121.37	0.64

### Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading				Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Min (°C)	Max (°C)	Average (°C)	MPa			
115.0	115.0	115.1	115.0	0.08	0.19	0.13	0.48
121.0	121.0	121.1	121.0	0.12	0.17	0.10	0.38

### Note

The quoted uncertainty include " Stability " and " Loading effect ( 20% of Uniformity ) "

UUC\* = Unit Under Calibration

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

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

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

2008 ๒๕๔๘-๒๕๔๙ : 35 หมู่๖ ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10700  
2008 Soi 35, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545





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## Certificate of Calibration

Cert. No.: 24TM835  
Page : 1 of 3

Equipment : Autoclave  
Manufacturer : ALP  
Model : CL-40L  
Serial No. : 810010  
ID No. : UAE.MIC.032/2565  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : 301 Room  
Received Order : 07 June 2024  
Calibration Date : 07 June 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by :   
Approved by :   
( )  
( )  
(✓)  
Issue Date : 11 June 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2406-0190OC-1  
Procedure Used :-

Cert. No.: 24TM835  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 Based on BS 2646-5 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1.) Data Acquisition	MY44073381	23LM73	TPA	18 May 2025

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

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

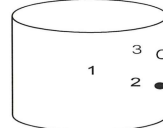
(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )  
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	58	222
Finished of Calibration	27	61	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	23-01TC-08
2 =	Temperature sensor	23-01TC-09
3 =	Exhaust port	23-01TC-10

เอกสารไม่ควบคุม



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2406-0190OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM835  
Page : 3 of 3

Operating parameter Set : Temperature = 115.0 °C  
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
115.0	115.0	1	115.296	0.17	0.09	0.75	2
		2	115.252				
		3	115.317				

Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 20 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121.0	121.0	1	121.096	0.24	0.13	0.75	2
		2	121.119				
		3	121.121				

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

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

UUC\* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม



## Certificate of Calibration

Equipment : Balance  
Model : PX623  
Serial No. (or ID.): C236754745 (UAE.MIC.055/2565)  
Manufacturer : Ohaus  
Condition : In condition

Certificate No.: C01234158  
Issued Date : 08 December 2023  
Job No.: WO-00011251  
Page : 1 of 3

Customer : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phrakhanong District, Bangkok, THAILAND 10260

Environment Condition : Temperature 25 °C ± 0.5 °C  
Humidity 54 %RH ± 1.7 %RH

Calibration Place : United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phrakhanong District, Bangkok, THAILAND 10260

Calibration By : Mr. Adisai Maknoi  
Calibration Date : 07 December 2023

The Method used : In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability : This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222534

Person in charge

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท เทคโนโลยีการบริการ จำกัด (มหาชน)  
DKSH Technology Limited  
2533 สุขุมวิท ถนน แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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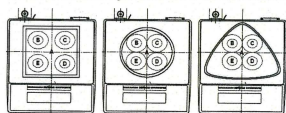
เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

## Calibration Results:

## Before Adjustment

**Eccentric Error:** Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value		200			(g)
Reference Points (g)					
A	B	C	D	E	
-	0.000	-0.003	0.000	0.001	

**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

**Error of indication from nominal or conventional mass value.,** Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.001	0.001	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.09
50	50.0001	50.000	0.000	0.0013	2.09
100	100.0001	100.001	0.001	0.0013	2.09
200	200.0004	200.002	0.002	0.0014	2.07
300	300.0005	300.002	0.002	0.0015	2.05
400	400.0006	400.004	0.003	0.0016	2.03
500	500.0006	500.008	0.007	0.0019	2.02
600	600.0007	600.009	0.008	0.0021	2.01

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด  
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## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, UKAS Lab14. Therefore, those parameters have not been assessed separately.

## Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.  
☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.  
☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ).  
; PFA - Probability of False Accept

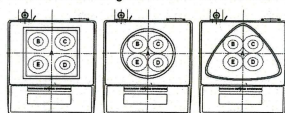
Authorized signatory

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## After Adjustment

**Eccentric Error:** Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value		200 (g)		
Reference Points (g)				
A	B	C	D	E
-	0.001	-0.002	-0.002	0.001

**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

**Error of indication from nominal or conventional mass value.,** Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.000	0.000	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.10
50	50.0001	50.000	0.000	0.0013	2.10
100	100.0001	100.000	0.000	0.0014	2.09
200	200.0004	200.000	0.000	0.0014	2.07
300	300.0005	300.001	0.001	0.0015	2.05
400	400.0006	400.002	0.001	0.0017	2.04
500	500.0006	500.001	0.000	0.0019	2.02
600	600.0007	600.002	0.001	0.0021	2.01

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## Statements of conformity:

## Before Adjustment

Readability: 0.001 g

Nominal Value (g)	Error of indication (g)	Guard band (w) (g)	Tolerance ( $\pm$ ) (g)	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.001	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.001	0.0013	0.200	Pass
200	0.002	0.0014	0.400	Pass
300	0.002	0.0015	0.600	Pass
400	0.003	0.0016	0.800	Pass
500	0.007	0.0019	1.000	Pass
600	0.008	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

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## Statements of conformity:

### After Adjustment

Readability: 0.001 g

Nominal Value g	Error of indication g	Guard band (w) g	Tolerance (±) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.000	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.000	0.0014	0.200	Pass
200	0.000	0.0014	0.400	Pass
300	0.001	0.0015	0.600	Pass
400	0.001	0.0017	0.800	Pass
500	0.000	0.0019	1.000	Pass
600	0.001	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

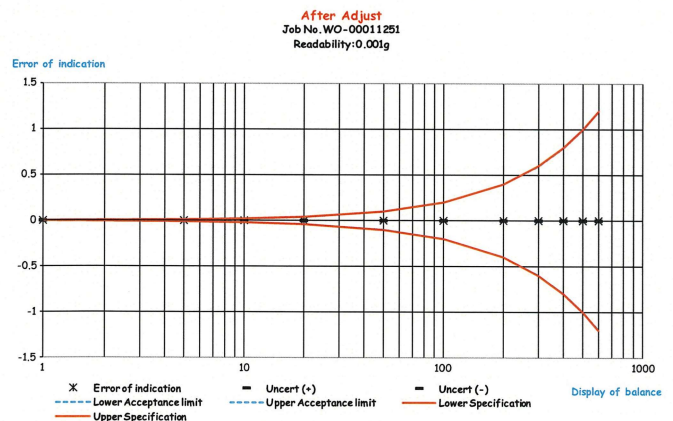
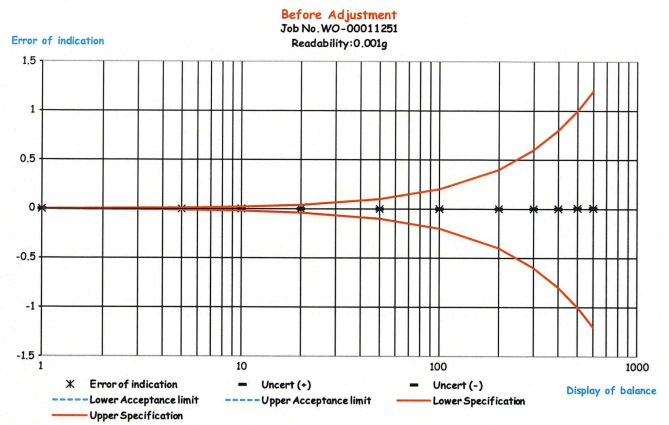
### The End of Statements of conformity

บริษัท ดีเคเอสเอ เอเชีย (ไทย) จำกัด  
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## ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00011251

ชนิดเครื่องมือ: Balance

รุ่น: PX623

หมายเลขเครื่อง: C236754745

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Dec 2023			07 Dec 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระดกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของไม่กด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานแข็ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและถาด load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

M [Redacted]  
Service Engineer

บริษัท ดีเคเอสเอ เอเชีย (ไทย) จำกัด  
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