

## ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์

## ภาคผนวก จ-1

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์  
คุณภาพอากาศ และระดับเสียง

## 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> )	Andersen Instruments, Inc.	G25A 1901	Jiranatee Associates Co., Ltd.	COF-002-66	14 Jul 23	13 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)	23P1400	9 May 23	8 May 24	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	23P1858	2 Jun 23	1 Jun 24	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	23H1200	6 Jun 23	5 Jun 24	-
5	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	23-ACT-118	4 Aug 23	3 Aug 24	-
6	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>	Rion, Japan	NL-62 00391458	Sithiporn Associates Co., Ltd.	ACL24063	18 Jan 24	17 Jan 25	-
7	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>		NL-62 00391494					



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.  
63/14-15, 67/35-36  
Petchkasem 7/71, Rd. Wattapra, Bangkokyai,  
Bangkok 10600 (Thailand)  
Tel: +6608680812  
Mobile: +66863999453  
E-mail: jnac-calibration@jiranatee.com  
Web site: www.jiranatee.com

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

Flow measurement laboratory  
Calibration services department.



NSC – TISI – TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-002-66

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : Andersen Instruments  
**MODEL/TYPE** : G25A  
**SERIAL NUMBER** : 1901  
**ID NUMBER** : UAE.ANV.051/2547  
**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** : 07 Jul 2023  
**MEASUREMENT DATE** : 14 Jul 2023  
**ISSUE DATE** : 18 Jul 2023

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 23.9 °C and 54.5%RH.

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

### TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☐ Mr. Sorawit Thachalad  
☒ Miss Jitraporn Lertsomphol



Approved signatory

Mr. Parinya Booncharoen  
Calibration Department Manager

เอกสารไม่ควบคุม

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



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number COF-002-66

Page 2 of 2 Pages

### 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	Y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.701	754.115	23.87	23.10	55.600	1.626	1.273	0.648
2	0.997	754.083	23.80	23.23	61.350	3.236	1.795	0.914
3	1.121	754.005	23.81	23.20	41.923	4.338	2.079	1.057
4	1.172	754.004	23.72	23.16	30.933	4.891	2.208	1.122
5	1.410	753.994	23.76	23.18	29.415	7.159	2.671	1.352

Slope (m): 1.98463  
Intercept (b): -0.01636  
Correlation coefficient (r): 0.99972  
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	Y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.701	754.115	23.87	23.10	55.600	1.626	0.800	0.651
2	0.997	754.083	23.80	23.23	61.350	3.236	1.129	0.917
3	1.121	754.005	23.81	23.20	41.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.126
5	1.410	753.994	23.76	23.18	29.415	7.159	1.679	1.357

Slope (m): 1.24306  
Intercept (b): -0.01029  
Correlation coefficient (r): 0.99972  
Uncertainty (k = 2): 0.015 m<sup>3</sup>/min

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



เอกสารไม่ควบคุม





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

## Certificate of Calibration

Certificate No. : 23P1400  
Page : 1 of 2

Equipment : U-Tube Manometer  
Manufacturer: Dwyer  
Model : 1221-36-W/M  
Serial No.: -  
ID No.: UAE.EFM.020/2560

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

Condition As-Received: Used Item

Received Date: 26 April 2023

Calibration Date: 09 May 2023

Reference: 2304-0703WSC

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

Ambient Temperature: ( 23 ± 2 ) °C

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,

Relative Humidity: ( 50 ± 15 ) %

Phrakhanong, Bangkok 10260

Atmospheric Pressure: 1010 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments  
Standard according to in-house calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure  
Gauges, Edition 03/2014 " 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-0137-22	24 Aug 2023

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 (NIMT)

Calibrated by : Suwit Aussarree  
Issue Date : 11 May 2023

Approved Signatory :

[ ] Phalinee Prabpaipal

[ ] Sura Suwannasri

[x] Attapol Panurach

เอกสารไม่ควบคุม

B 0314240



Cert.No.: 23P1400  
Page: 2 of 2

Result of calibration:- Without adjustment

Range : 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>O

Function:- Pressure Measurement

Scale Interval : 0.1 inH<sub>2</sub>O( The Fifth Estimate )

Increasing Pressure

UUC Indication				
Applied Pressure	High-port side	Low-port side	ΔP	Error
(inH <sub>2</sub> O)	(inH <sub>2</sub> O)	(inH <sub>2</sub> O)	(inH <sub>2</sub> O)	(inH <sub>2</sub> O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.02	-7.02	14.04	0.04
16.00	8.02	-8.02	16.04	0.04
18.00	9.04	-9.04	18.08	0.08
20.00	10.04	-10.04	20.08	0.08
22.00	11.02	-11.02	22.04	0.04
24.00	12.02	-12.02	24.04	0.04
26.00	13.02	-13.00	26.02	0.02
28.00	14.00	14.00	0.00	-28.00
30.00	15.00	-15.00	30.00	0.00
32.00	16.00	-15.98	31.98	-0.02
34.00	17.00	-16.96	33.96	-0.04
35.80	18.00	-17.94	35.94	0.14

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

\* UUC = Unit Under Calibration

\* ΔP = High-port side - Low-port side

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 %.

-o0o-

เอกสารไม่ควบคุม  
a 1160341



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. : 23P1858

Page : 1 of 2

Equipment : Aneroid Barometer  
Manufacturer: Barigo  
Model : -  
Serial No.: -  
ID No.: UAE.ANV.124/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 02 June 2023

Reference: 2305-0919WSC

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

Ambient Temperature: ( 23 ± 2 ) °C

81 Soi Udomsuk 41, Sukhumvit Road,

Relative Humidity: ( 50 ± 15 ) %

Bangchak, Phrakhanong, Bangkok 10260

Atmospheric Pressure: 1007 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

### Condition of this result of calibration

1.Reference standards instruments :

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew  
Issue Date : 08 June 2023

Approved Signatory :

[ ] Phalinee Prabpaipal

[ ] Sura Suwannasri

[x] Attapoi Panurach

เอกสารไม่ควบคุม  
B 0316958



Cert.No.: 23P1858

Page: 2 of 2

Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale interval : 1 hPa ( The Fifth Estimate )

### Increasing Pressure

Applied Pressure (hPa)	959.93	970.47	981.93	991.32	1002.29	1011.64	1021.14	1032.30
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	0.07	-0.47	-1.93	-1.32	-2.29	-1.64	-1.14	-2.30

### Decreasing Pressure

Applied Pressure (hPa)	1032.30	1021.44	1011.67	1002.36	992.35	981.94	970.49	959.94
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.30	-1.44	-1.67	-2.36	-2.35	-1.94	-0.49	0.06

The uncertainty of measurement was ± 0.30 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 %.

-o0o-

เอกสารไม่ควบคุม  
a 1165506



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. : 23H1200  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: UAE.ANV.130/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 30 May 2023  
to 06 June 2023

Reference: 2305-0919WSC

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) Hygro-M2 Dew Point Monitor	5112	2360195	20703	02 Aug 2023
2) Handheld Thermometer With Sensor	1523	3240076	231305	15 Mar 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:-

-National Institute of Standards and Technology (NIST) , The United States of America

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

Calibrated by : Somchai Dumwor  
Issue Date : 07 June 2023

Approved Signatory :

☒ Chakrit Waewwanjua  
☐ Pornthippa Tameyakul  
☐ Viporn Tantiyawutti

เอกสารไม่ควบคุม  
B 0316274



Cert. No.: 23H1200  
Page.: 2 of 2

### Result of Calibration:-

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	48	7.9	1.6
25.0	60.0	63	3.0	1.7
25.0	80.0	76	-4.0	1.9

### Result of Calibration:-

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	60	0.0	1.7
25.0	80.0	75	-5.0	1.9

### Result of Calibration:-

Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
19.987	20.0	0.013	0.72
30.016	30.0	-0.016	0.72
39.944	39.5	-0.444	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%.

-o0o-

เอกสารไม่ควบคุม  
a 1165295



### Certificate of Calibration

#### Customer

Name : UNITED ANALYST AND ENGINEERING

Certificate No : 23-ACT-118

CONSULTANT CO.,LTD.

Request No : Req-2023-1547

Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,

Prakanong, Bangkok 10260

#### 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 ±2 °C )

Humidity : (50 ± 20 %RH )

Barometric Pressure : (1013 ±10.0 hPa )

Received Date : 21 July 2023

Calibration Date : 4 August 2023

Location of Calibration : LAB 1 Acoustic

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

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

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

#### Note

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

Calibrated By :

Mr. Noppadon Luangart  
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn  
Calibration Engineer Supervisor

Issue Date : 4 August 2023

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

FM-708-ACT-02 Rev.00 Issue Date 01/07/23

เอกสารไม่ควบคุม

Certificate No : 23-ACT-118

Request No : Req-2023-1547

#### Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty ( ± dB)	Acceptance limit Class 2 ( ± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.14	0.14	-	-	0.13	0.40
114 dB / 1000 Hz	114.15	0.15	-	-	0.13	0.40

#### Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty ( ± %)	Acceptance limit Class 2 ( ± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.04	-	0.40	3.0
114 dB / 1000 Hz	0.20	-	0.40	3.0

#### Note :

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration

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

FM-708-ACT-02 Rev.00 Issue Date 01/07/23

เอกสารไม่ควบคุม

Cert. No. : ACL24063  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-62 / Microphone UC-59L / Preamplifier NH-26  
**Serial No.:** 00931458 / 01748 / 01553  
**ID No.:** UAE.EFM.025/2564

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

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

**Received Date :** 21 DECEMBER 2023  
**Calibration Date :** 18-19 JANUARY 2024  
**Date of Issue :** 22 JANUARY 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Thanakul Petchurai )

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

เอกสารควบคุม

Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

### Calibration Method :

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 3 of 8

**Summary of Measurement Result :**

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	94.0	0.0	±0.3

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
15.8

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

Frequency Weighting	Measured value ( dB )
A - weight	11.8
C - weight	16.5
Flat	23.7

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

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

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 5 of 8

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

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.1	0.0	0.0	±1.0
125	0.1	0.1	0.1	±1.0
250	0.1	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.1	+ 2.5, -16.0

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

**5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 6 of 8

**7. Level linearity on the reference level range**

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

เอกสารควบคุม



**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 7 of 8

**8. Level linearity including the level range control**

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

**9. Tone burst response**

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

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lcpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.1	-0.3	±2.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24063  
Job No. : VC67AC0034  
Pages : 8 of 8

**11. Overload indication**

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

**12. High level stability**

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

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

End of Calibration Certificate

เอกสารควบคุม



**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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

SITHIPORN  
associates



Cert. No. : ACL24064  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-62 / Microphone UC-59L / Preamplifier NH-26  
**Serial No.:** 00391494 / 01184 / 01589  
**ID No.:** UAE.EFM.026/2564

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANONG DISTRICT, BANGKOK 10260  
THAILAND.

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

**Received Date :** 21 DECEMBER 2023  
**Calibration Date :** 18-19 JANUARY 2024  
**Date of Issue :** 22 JANUARY 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Thanakul Petchurai )

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

**เอกสารควบคุม**

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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

SITHIPORN  
associates



Cert. No. : ACL24064  
Job No. : VC67AC0034  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

### Calibration Method :

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

**เอกสารควบคุม**

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
Job No. : VC67AC0034  
Pages : 3 of 8

**Summary of Measurement Result :**

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
Job No. : VC67AC0034  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	94.0	0.0	±0.3

**2. Self-generated noise**

**2.1 Normal test**

Measured Value ( dB )
14.0

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

Frequency Weighting	Measured value ( dB )
A - weight	10.4
C - weight	15.5
Flat	23.6

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

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.7	0.7	0.7	± 1.0
1000	0.6	0.6	0.6	± 0.7
8000	0.7	0.8	0.8	+ 1.5, - 2.5

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
Job No. : VC67AC0034  
Pages : 5 of 8

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

Weighting network response with relative to 1 kHz.

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

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

**5.1 Frequency weightings at 1 kHz**

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

**5.2 Time weighting at 1 kHz**

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

**6. Long - term stability**

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
Job No. : VC67AC0034  
Pages : 6 of 8

**7. Level linearity on the reference level range**

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.1	0.1	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.1	0.1	±0.8
69.0	69.1	0.1	±0.8
64.0	64.0	0.0	±0.8
59.0	59.1	0.1	±0.8
54.0	54.0	0.0	±0.8
49.0	49.1	0.1	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.1	0.1	±0.8
30.0	30.0	0.0	±0.8
29.0	29.1	0.1	±0.8
28.0	28.1	0.1	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.1	0.1	±0.8

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
 Job No. : VC67AC0034  
 Pages : 7 of 8

**8. Level linearity including the level range control**

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

**9. Tone burst response**

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

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lcpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.1	-0.3	±2.0

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

เอกสารควบคุม

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACL24064  
 Job No. : VC67AC0034  
 Pages : 8 of 8

**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.7	89.5	-0.2	±1.5

**12. High level stability**

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	136.9	136.9	0.0	±0.1

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

End of Calibration Certificate

เอกสารควบคุม

## ภาคผนวก จ-2

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์  
คุณภาพน้ำทิ้ง และน้ำผิวดิน

รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจวัดคุณภาพน้ำ									
1	pH Meter	ความเป็นกรดและด่าง อุณหภูมิ	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2401718-001-01	11 Mar 24	10 Mar 25	-
2	pH Meter		Mettler-Toledo	Seven Easy S20 / 1230525212	DKSH (Thailand) Ltd.	C07240167	9 Apr 24	8 Apr 25	-
3	Analytical Balance (Readability 0.1 mg)	น้ำหนักและไขมัน	Mettler-Toledo	XSR204 / C117635043	Technology Promotion Association (Thailand-Japan)	24MM293	45423	45787	-
4	Analytical Balance (Readability 0.01 mg)	ของแข็งแขวนลอยทั้งหมด สารแขวนลอย	Mettler-Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2402283-001-01	45384	45748	-
5	Hot Air Oven	สารที่ละลายได้ทั้งหมด	Memmert	UF55 / B216.1666	National Food Institute, Ministry of Industry, Thailand	2400141-001-01	11 Oct 23	10 Oct 24	-
6	UV-VIS Spectrophotometer	ซีลีเฟด ฟอสเฟต	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP24-018	7 May 24	6 May 25	-
7	UV-VIS Spectrophotometer	ความขุ่น สี	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP24-008	16 Jan 24	15 Jan 25	-
8	Digester Unit	ไนโตรเจนในรูปของทีเคเอ็น	FOSS TECATOR	2520auto / 91794469	FOSS South East Asia	9809	8 Feb 24	7 Feb 25	-
9	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT8100 / 91889052	FOSS South East Asia	8411	29 May 23	28 May 24	-
10	Ion Selective Electrode Meter (ISE)	Fluoride Nitrate	Orion	Star A214 / X36836	Science Tech Co.,Ltd.	FT005/23	29 May 23	28 May 24	-
11	Atomic Absorption Spectrometer (AAS)	Asenic ,Copper ,Iron ,Lead , Mercury ,Manganese ,Zinc Cadmium ,Chromium	Agilent Technologies	System ID:G8432A AA240FS / MY13160001	Thailand Institute of Scientific and Technological Research(TISTR)	MTC.ACL.No 358/67	11 Mar 24	10 Mar 25	-
12	Atomic Absorption Spectrometer (AAS)		Perkin Elmer	PinAAcle 900F / PFBS20031902	Perkin Elmer Co.,Ltd.	PM Service No. WO-02273773	26 Jun 23	25 Jun 24	-



รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจวัดคุณภาพน้ำ									
13	BOD Incubator	บีโอดี (BOD)	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	24TM303	10 Feb 24	9 Feb 25	-
14	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.002/2550)	Technology Promotion Association (Thailand-Japan)	23TM1176	21 Jul 23	19 Jul 24	-
15	DO Meter	ออกซิเจนละลาย	YSI	4010-2W / 20260326	Technology Promotion Association (Thailand-Japan)	23TW228	18 Oct 23	17 Oct 24	-
16	Incubator	โคลิฟอร์มแบคทีเรียทั้งหมด ฟิคอลโคลิฟอร์มแบคทีเรีย	Binder	BD 53 / 13-07343	Technology Promotion Association (Thailand-Japan)	23TM192	16 Feb 23	15 Feb 24	-
17	Incubator		Memmert	INB400 / E411.1325	Technology Promotion Association (Thailand-Japan)	23TM809	10 Jul 23	9 Jul 24	-
18	Water Bath	โคลิฟอร์มแบคทีเรียทั้งหมด ฟิคอลโคลิฟอร์มแบคทีเรีย	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	24TM29	10 Feb 24	8 Feb 25	-
19	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	24TM30	10 Feb 24	8 Feb 25	-
20	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	C01234158	7 Dec 23	6 Dec 24	-
21	Auto Clave		ALP	CL-40L / 810010	DKSH (Thailand) Ltd.	C11230106	9 Jun 23	8 Jun 24	-
22	Auto Clave		ALP	CL-40L / 807298	National Food Institute, Ministry of Industry, Thailand	2304203-001-01	10 Aug 23	9 Aug 24	-
23	Auto Clave		ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2402281-001-01	2 Apr 24	1 Apr 25	-

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

## Calibration Certificate

**Certificate No.:** 2401718-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udumsuk 41, Sukhumvit Road,  
Bangchack, Prakhong, 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** Mr.Manas Somsak **Approved by**   
Specialist ( Mr.Pheraphat Tuanjit )  
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



nfi.or.th

## 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	NFI.BTH 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-555/30620/22 (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



nfi.or.th



## 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 )  
(offset value before adjust: -0.4 mV)

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

## 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:

- 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 ).

### 2. Reference Standard Instrument :

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

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

## 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



## Certificate of Calibration

**Equipment:** pH METER **Certificate No.:** C07240167  
**Model:** SevenEasy **Issued Date:** 9 April 2024  
**Serial No. (or ID.):** 1230525212 (UAE.WAS.003/2553) **Job No.:** WO-00024208  
**Manufacturer:** METTLER TOLEDO **Page:** 1 of 3  
**Electrode Serial No.:** 1156883 **Model:** InLab Solids **Brand:** METTLER TOLEDO  
**Condition:** In Condition

**Customer:** United Analyst and Engineering Consultant Company Limited  
3 Soi Udumsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand

**Environment Condition:** Temperature 23 °C ± 2 °C  
Humidity 50 %RH ± 15 %RH

**Calibration Place:** Environment Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

**Calibration By:** Miss.Orawan Khlaiphloi

**Calibration Date:** 9 April 2024

**The Method used:** In house method, CAL-WI-58, base on ASTM E 70-07

**Traceability:** This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPChem Ltd. (ISO/IEC 17034) Certificate No. 938377, 931985, 931984 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20230350EA

(Miss Orawan Khlaiphloi)  
Person in charge

(Mr. Nitinun Srihawan)  
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.

## Calibration Results:

### pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.00	0.58	2.00
354.96	355	0.04	1.00	0.58	2.00
295.8	296	0.20	2.00	0.58	2.00
236.64	237	0.36	3.00	0.58	2.00
177.48	178	0.52	4.00	0.58	2.00
118.32	118	-0.32	5.00	0.58	2.00
59.16	59	-0.16	6.00	0.58	2.00
0	0	0.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-118	0.32	9.00	0.58	2.00
-177.48	-177	0.48	10.00	0.58	2.00
-236.64	-236	0.64	11.00	0.58	2.00
-295.8	-296	-0.20	12.00	0.58	2.00
-354.96	-355	-0.04	13.00	0.58	2.00
-414.12	-414	0.12	14.00	0.58	2.00

## Practical slope and zero point\*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.985 and pH 9.997

-During calibration, display of pH meter reading; pH 4.00 , pH 7.00 and pH 10.01

The practical slope of the pH electrode; 57.01 (mV/pH), 96.37%

The zero point of the pH electrode; 6.88 (pH)

## Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	3.99	-0.018	0.0070	2.00
6.985	7.00	0.015	0.0091	2.00
9.997	10.02	0.023	0.0074	2.00

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

The End of Certificate



## Certificate of Calibration

**Equipment:** Digital Thermometer with Probe  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**Manufacturer:** METTLER TOLEDO  
**ID No.:** UAE.WAS.003/2553

**Certificate No.:** C15240373  
**Issued Date:** 09 April 2024  
**Job No.:** WO-00024208  
**Page:** 1 of 2  
**Condition:** In Condition

**Customer:** United Analyst and Engineering Consultant Company Limited  
3 Soi Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand

**Environment Condition:** Temperature: 22 °C ± 3 °C  
Humidity: 50 %RH ± 20 %RH  
Voltage: 220 VAC ± 10 %

**Calibration Place:** Thermo-Hygro Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

**Calibration By:** Mr. Nateekarn Mitjit  
**Calibration Date:** 09 April 2024  
**The Method used:** In house method, CAL-WI-19, by comparison with standard thermometer  
**Traceability:** This certificate is traceable to the International System of Unit maintained by Quality Reborn Co.,Ltd. (QR) Certificate No. QR23-1073

(Mr. Nateekarn Mitjit)  
Person in charge

(Mr. Pramote Ramrong)  
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.



Certificate No.: C15240373

Page: 2 of 2

### Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR23-1073	2 May 23	2 May 24

### Calibration Results:

#### Without Adjustment

Sensor Type: RTD

Channel: -

Diameter (mm) 4

Length (mm): 135

Immersion (mm): 110

Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
15.0	15.010	15.1	-0.090	0.076
25.0	25.006	25.1	-0.094	0.076
35.0	35.004	35.0	0.004	0.076

The End of Certificate






TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert.No.: 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 Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Balance Room (108)  
**Received order :** 11 May 2024  
**Calibration Date :** 11 May 2024  
**Ambient Temperature :** 15 °C to 40 °C  
**Relative Humidity :** 30 % to 90 %  
**Calibrated by :** Khit Ruttanaprapachai  
**Approved by :**   
( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

**Issue Date :** 15 May 2024

**The Uncertainties are for a confidence probability of approximately 95%**

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

เอกสารไม่ควบคุม



**Equipment :** Electronic Balance  
**Condition As-Received :** Used Item  
**Reference :** 2405-0166OC-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

#### 1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This result of calibration was made on requested at the point specified by customer.

4. This certificate is not certified for any commercial transaction.  
5. 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

เอกสารไม่ควบคุม



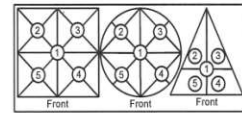
Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2405-0166OC-2

#### Result of calibration

#### 2. Effect of off center loading

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

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



Maximum difference between  
off-center and central loading  
(g)  
0.0003

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
+0.0002	-0.0001	0.0000	+0.0002	0.0000

#### 3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
5	5.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
20	20.0000	0.0000	0.19	2.03
50	50.0001	-0.0001	0.19	2.06
60	60.0001	-0.0001	0.19	2.04
80	80.0001	-0.0001	0.27	2
100	100.0002	-0.0002	0.27	2.03
120	120.0001	-0.0001	0.29	2
200	200.0001	-0.0001	0.31	2

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

-000-

เอกสารไม่ควบคุม



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



## Calibration Certificate

Certificate No.: 2402283-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udumsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: XSR205DU  
Serial No.: C009071872  
ID No.: UAE.WAO.012/2563  
Order No.: 2402283  
Operation No.: 2402283-001  
Date of Receipt: 2 April 2024  
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong  
Scientist

Approved by ( Mr.Pheraphat Tuanjit )

Date of Issue: 9 April 2024

Manager, Division of Calibration Laboratory  
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 36 นานาชาติ 36 ปีแห่งการพัฒนาอุตสาหกรรมอาหาร เอกสารไม่ควบคุม  
2008 Soi 36, Arun Amarin Road, Bang Yi Khan, Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545



nfi.or.th

## Calibration Report

**Certificate No.:** 2402283-001-01

**Equipment:** Electronic Balance  
**Model:** XSR205DU  
**Serial No.:** C009071872  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.00001 g / 0.0001 g  
**ID No.:** UAE.WAO.012/2563

**Date of Calibration:** 2 April 2024

Page 2 of 4

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

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

**Condition of Equipment:** Good Condition

**Condition of This Results of Calibration:**

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

**Calibration Results:**

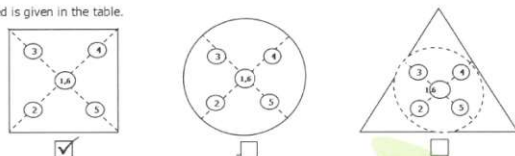
**1. Repeatability of Reading:**

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

**2. Off-Center Error:**

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

The balance reading obtained is given in the table.



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

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



## Calibration Report

**Certificate No.:** 2402283-001-01

**Equipment:** Electronic Balance  
**Model:** XSR205DU  
**Serial No.:** C009071872  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.00001 g / 0.0001 g  
**ID No.:** UAE.WAO.012/2563

**Date of Calibration:** 2 April 2024

Page 3 of 4

**Calibration Results:** (Continued)

**Calibration Range:** 0 - 80 g

**Calibration Adjustment:** Internal Calibration

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

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unload	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00499	0.00001	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000068	2.00
80	80.000068	80.00005	0.00002	0.00011	2.00

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





## Calibration Report

**Certificate No.:** 2402283-001-01

**Equipment:** Electronic Balance  
**Model:** XSR205DU  
**Serial No.:** C009071872  
**Capacity:** 220 g

**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.00001 g / 0.0001 g  
**ID No.:** UAE.WAO.012/2563

**Date of Calibration:** 2 April 2024

Page 4 of 4

**Calibration Results:** (Continued)

**Calibration Range:** 81 - 200 g

**Calibration Adjustment:** Internal Calibration

**3. Departure from Nominal Value:** (Range: 81 - 200 g ; Resolution: 0.0001 g )

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
90	90.00010	90.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

----- End -----

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



## Calibration Certificate

**Certificate No.:** 2400141-001-01

**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:** CHAMBER (Hot Air Oven)

**Manufacturer:** MEMMERT

**Model:** UF 55

**Serial No.:** B216.1666

**ID No.:** UAE.WAO.027/2559


**Order No.:** 2400141

**Operation No.:** 2400141-001

**Date of Receipt:** 11 October 2023

**Date of Calibration:** 11 October 2023

**Calibrated by** Mr.Worapob Sooktong  
 Scientist

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

**Date of Issue:** 16 October 2023

**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.:** 2400141-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
Model: UF 55 Serial No.: B216.1666  
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559  
Manufacturer: MEMMERT  
**Date of Calibration:** 11 October 2023

Page 2 of 3

**Location:** Laboratory, Floor 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Environment Condition:** Ambient Temperature ( 28 ± 1 ) °C  
Relative Humidity ( 63 ± 2 ) %  
Line Voltage ( 228 ± 1 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.  
- 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.

### Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 660380-01	22 April 2024	NATIONAL FOOD INSTITUTE
	RTD	CH#201-209/ RTD#201-209			

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

### UUC Description :

Time of Record 1 Hour 9 Minute At 104.0, 140.0 and 180.0 °C  
Fresh air Damper - Open Position -

X Close  
- Not Available

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

## Calibration Report

**Certificate No.:** 2400141-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
Model: UF 55 Serial No.: B216.1666  
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559  
Manufacturer: MEMMERT  
**Date of Calibration:** 11 October 2023

Page 3 of 3

**Calibration point:** 104.0, 140.0 and 180.0 °C

### Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	28.2	61.4	227.4
MAX	28.3	65.1	229.3

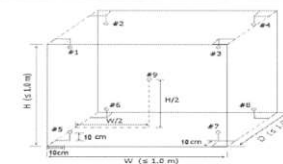


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0	104.05	103.98	104.02	104.08	104.00	104.05	103.99	104.17	104.00	0.53
140.0	140.09	139.99	139.91	140.05	139.99	139.91	139.97	140.26	139.97	0.73
180.0	180.46	180.33	180.25	180.28	180.33	179.96	180.31	180.64	180.16	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.090	0.18	0.38
140.0	140.0	140.1	140.0	0.075	0.28	0.47
180.0	180.0	180.1	180.0	0.13	0.48	0.88

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp 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 -----



## 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 :   
(Mr. Tanawut Rittidach)

Technical Manager

Approved by :   
(Ms. Chonthicha Sangngern)

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.

เอกสารไม่ควบคุม



## REPORT OF CALIBRATION

Certificate No. : SP24-018 Page 2 of 5

Environment Condition : Ambient Temperature  $25 \pm 5$  °C

Relative 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.

เอกสารไม่ควบคุม

**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 <i>k</i>
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

เอกสารไม่ควบคุม

**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 <i>k</i>
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

เอกสารไม่ควบคุม



**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 <i>k</i>
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-708-02 R01 1/11/2021**CERTIFICATE OF CALIBRATION**

Certificate No. : SP24-008

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 : Hitachi

Model : U-1900

Serial No. : 2021-064

ID No. : UAE.WAS.006/2552

Received Date : 16 January 2024

Calibration Date : 16 January 2024

Issue Date : 19 January 2024

Condition Instrument : Good

Calibrated by :

( Mr.Tanawut Rittidach )

Technical Manager

Approved by :

( Ms. Chonthicha Sangnern )

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.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

## REPORT OF CALIBRATION

Certificate No. : SP24-008

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 Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

## REPORT OF CALIBRATION

Certificate No. : SP24-008

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	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.046	0.0024	0.0029	2.00
	2.1876	2.186	0.0016	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.024	-0.0001	0.0035	2.00
	2.1230	2.121	0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.999	0.0012	0.0033	2.00
	1.9973	1.994	0.0033	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.080	0.0003	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.051	0.0008	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

**REPORT OF CALIBRATION**

Certificate No. : SP24-008

Page 4 of 5

**Photometric Accuracy :**

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.748	-0.0011	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.865	0.0024	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.293	-0.0011	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

**REPORT OF CALIBRATION**

Certificate No. : SP24-008

Page 5 of 5

**Wavelength Accuracy :**

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.54	241.1	0.44	0.18	2.00
279.40	278.9	0.50	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.8	0.42	0.18	2.00
361.26	360.8	0.46	0.18	2.00
418.48	418.2	0.28	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.1	0.10	0.18	2.00
460.06	459.6	0.46	0.18	2.00
536.90	536.4	0.50	0.18	2.00
637.94	637.6	0.34	0.18	2.00
440.74	440.1	0.64	0.18	2.00
472.22	472.0	0.22	0.18	2.00
513.70	513.5	0.20	0.18	2.00
528.72	528.2	0.52	0.18	2.00
574.60	574.3	0.30	0.18	2.00
585.48	585.0	0.48	0.20	2.00
684.63	684.2	0.43	0.18	2.00
740.27	740.0	0.27	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.8	0.36	0.18	2.00
879.70	879.2	0.50	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-708-02 R01 1/11/2021



# FOSS

## Customer Service Report

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

Report No: 9809

Date: 8 Feb 2024

Customer: UAE

Instrument: DT2520

Address: Bangkok

Serial: 91794469

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:00	14:00	16:00
Finish	09:30	16:00	18:00

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

PO/Quote Number: If applicable

PMA Type: FOSScare if applicable Contract No. if applicable

Details of Work / Test	Condition / Status
# PM DT2520	
- ตรวจสอบเครื่องวัด	
- ตรวจสอบ Connection	
- ตรวจสอบ Cable kit, temp cut out	
- ตรวจสอบ meter	
- 300- 1000 = 10 min	
- 300- 420 = 37 min	
- Instrument 91794469 meter = 4190	
Instrument Ready for Use	OK Not OK If not OK - Comment

Part No:	Batch	Description	Qty
60079652	23.09.2023	Cable kit digator	1
10013554	03.01.2023	Temperature cutout	1

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

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

เอกสารไม่ควบคุม

# FOSS

## Customer Service Report

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

Report No: 8411

Date: 27/05/23

Customer: UAE

Instrument: KT8100

Address: Bangkok, Thailand

Serial: 91829052

Hours	Travel To Customer	Labour	Travel From Customer
Start	07:00	09:00	16:30
Finish	08:30	15:00	18:30

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

PO/Quote Number: If applicable

PMA Type: FOSScare if applicable Contract No. if applicable

Details of Work / Test	Condition / Status
- ตรวจสอบ Function Tat เครื่องวัด PM	OK
- ตรวจสอบ Part ของ PM - kit 8100/8100 12 Mo	OK
- ตรวจสอบ Heating Coil = 32.3 ohm	OK
- ตรวจสอบ Spash head Steam Generator	OK
- ตรวจสอบ Steam Valve = 54.8 ohm	OK
- ตรวจสอบ Condenser Water Cooling Valve A, B = 54.8 ohm	OK
- ตรวจสอบ Water 100 ml → 100 ml Atkell 10ml → 51 ml	OK
- ตรวจสอบ Water 170 ml	OK
- ตรวจสอบ Blank = 0.12 Accuracy = 100%	
Instrument Ready for Use	OK Not OK If not OK - Comment

Part No:	Batch	Description	Qty
60031807	18.07.2022	Foss PM kit KT8100/8100 12 Mo	1

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

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

เอกสารไม่ควบคุม



## SCIENCE TECH CO., LTD.

Head Office : 321/43 Nanglinchee Rd. Chongnondsee Yannawa Bangkok 10120  
Thailand Tel. 0-2285-4101 Fax. 0-2285-4856 www.sciencetech.th.com  
Science Tech Laboratory : 279/27-29 Soi Watpoman Sathupradit 19 Rd.  
Chongnondsee Yannawa Bangkok 10120 Tel. 0-2285-4101 Fax. 0-2285-4856

Job No. : JF005/23

Certificate No. : FT005/23

Page : 1 of 2

### Certificate of Calibration

Equipment : pH/ISE Meter  
Manufacturer : Orion  
Made in : USA.  
Model : STAR A214  
Serial No. : X36836  
ID No. : UAE.WAT.025/2560  
Ion Selective Model : 9409BN  
Serial No. : ZW1-18420  
Reference Electrode Model : 900100  
Serial No. : ZW1-16834  
Range : 0 to 14 pH  
Resolution : 0.001 pH 0.1 mV  
Submitted by : บริษัท ยู ไนเต็ด แอนนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
3 ซอยอุดมสุข 41 ถนนสุขุมวิท แขวงบางจาก  
เขตพระโขนง กรุงเทพฯ 10260  
Ambient Temperature : (25 ± 3) °C  
Relative Humidity : (50 ± 15)%  
Issue date : Tuesday, May 30, 2023  
Calibrated by : Khannika Sangkham  
Approved by :  
(Khannika Sangkham)  
Laboratory manager

เอกสารไม่ควบคุม



## Certificate of Calibration

Job No. : JF005/23

Certificate No. : FT005/23

Received date : Sunday, May 28, 2023

Page : 2 of 2

Calibration date : Monday, May 29, 2023

### Condition of this calibration result

- 1 Reference standard materials : Certified Fluoride standard reference solution (Directly measured by differential potentiometry with the aid of potassium fluoride "quasi without transference" against solutions prepared from primary reference materials from NIST)
- 2 This certificate was certified only for the instrument we calibrated
- 3 This result of calibration was found accurate as shown on date and place of calibration only

### Result of Calibration

Function : pH/ISE Meter with Probe

#### Direct Measurement

First Standard concentrated = 0.1 ppm  
Secondary Standard concentrated = 1 ppm  
Tertiary Standard concentrated = 10 ppm  
Fourthly Standard concentrated = 100 ppm  
Slope = -59.1 mV/Dec.

Channel : 1

Unit Under Calibration	Standard Concentrated ( ppm )	UUC Reading ( ppm )	Correction ( ppm )	Stdev ( ppm )
Model :	0.1	0.099	0.001	0.01
9409BN S/N. ZW1-18420	1	1.03	-0.03	0.01
900100 S/N. ZW1-16834	10	10.4	-0.4	-0.42
	100	102	-2	0.70

-00000-

เอกสารไม่ควบคุม





Request No. 25-67 / 0275

MTC. ACL.No. 358 / 67

## CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"

Model AA240FS, Serial No. MY13160001

2. Working standard solution "Inorganic Ventures"

Multi Analyte Custom Grade Solution, Lot No. S2-MEB675610

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.

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

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer  
(WI-500-02-30)

2. Estimation Uncertainty of Measurement in Analytical Chemistry (QP-513)

CALIBRATION RANGE: 0.02, 0.10, 0.30, 0.50, 0.70 mg/l at 228.8 nm.Cd, 0.10, 0.20, 0.30, 0.50, 0.70 mg/l at 357.9 nm.Cr,  
0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 324.7 nm.Cu, 0.10, 0.30, 0.50, 0.70, 1.00 mg/l at 248.3 nm.Fe,  
0.20, 0.50, 0.70, 1.00, 1.50 mg/l at 217.0 nm.Pb, 0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 279.5 nm.Mn,  
0.10, 0.30, 0.50, 0.70, 1.00 mg/l at 232.0 nm.Ni, 0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 213.9 nm.Zn

CALIBRATION DATE : 2 February 2024

REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "CARLO ERBA"

Cadmium Lot No. 0006589926, Chromium Lot No. 0112384886, Copper Batch No. T117098A, Iron Batch No. T126087A,  
Lead Lot No. 1227873, Manganese Batch No. T109228A, Nickel Batch No. T270178A, Zinc Batch No. T820140AAMBIENT CONDITIONS : Temperature  $25 \pm 5$  °C Relative humidity  $50 \pm 20$  %The Atomic Absorption Spectrophotometer has been calibrated against Reference Material  
traceable to National Institute of Standards and Technology ( NIST ) by The Analytical Chemistry Laboratory.  
The results are attached herewith.

Calibrated by .....

( Mr. Atipat Ratana )

Approved by .....

(Miss Sutadde Deawtong)

Director of Analytical Chemistry Laboratory

Ref. 2015267020100454001

Issued Date : 11 March 2024

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม



Request No. 25-67 / 0275

1 / 5

MTC. ACL. No. 358 / 67

## CALIBRATION DATA

## 1. Noise Level

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	0.0006	0.0004	-0.0003	0.0001	-0.0011	-0.0005	0.0008	0.0004
	0.001	0.0017	-0.0009	0.0008	0.0001	0.0002	-0.0003	0.0007
	0.0006	0.0017	-0.0020	0.0005	0.0005	0.0004	0.0013	0.0014
	0.0001	0.0018	-0.0007	0.0005	0.0004	-0.0003	-0.0001	0.0010
	-0.0001	0.0019	-0.0014	0.0003	0.0010	0.0000	0.0002	-0.0001
	0.0011	0.0014	-0.0017	0.0009	-0.0008	0.0004	0.0006	0.0010
	-0.0002	0.0015	-0.0015	0.0003	0.0002	-0.0008	0.0009	0.0013
	0.0006	0.0012	-0.0001	0.0006	0.0008	0.0001	-0.0002	0.0013
	0.0008	0.0009	-0.0003	0.0003	0.0005	0.0002	0.0001	0.0007
	0.0012	0.0011	-0.0012	0.0008	0.0003	0.0004	0.0004	0.0013
	0.0003	0.0015	-0.0019	0.0001	-0.0002	0.0000	-0.0003	0.0003
	0.0005	0.0017	-0.0019	-0.0007	0.0000	-0.0007	0.0005	0.0005
	-0.0006	0.0016	0.0000	0.0006	-0.0001	0.0013	0.0006	0.0010
	0.0003	0.0011	-0.0002	0.0001	-0.0007	0.0009	0.0009	0.0002
	0.0003	0.0012	-0.0011	0.0007	-0.0003	-0.0003	0.0010	0.0009
	0.0004	0.0018	-0.0016	-0.0004	-0.0006	0.0008	0.0007	0.0007
	-0.0001	0.0018	-0.0018	0.0013	-0.0006	-0.0001	0.0014	0.0006
	0.0003	0.0017	-0.0001	0.0001	-0.0012	-0.0004	0.0001	0.0002
	0.0010	0.0018	-0.0007	0.0003	-0.0005	-0.0002	0.001	0.0003
	0.0004	0.0019	-0.0008	-0.0001	-0.0004	0.0003	0.0002	0.0008
Average Absorbance	0.000	0.001	-0.001	0.000	0.000	0.000	0.000	

Continue 2 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม



Request No. 25-67 / 0275

2 / 5

MTC. ACL. No. 358 / 67

## 2. Precision

Element	Conc. (mg/l)	Absorbance										Ave. Abs.	SD	%RSD
Cd	0.02	0.0078	0.0076	0.0069	0.0075	0.0071	0.0070	0.0076	0.0074	0.0077	0.0067	0.007	0.0004	5.15
	0.30	0.1008	0.1007	0.0999	0.0997	0.1000	0.0996	0.1008	0.1002	0.1005	0.0999	0.100	0.0005	0.46
	0.70	0.2301	0.2306	0.2277	0.2305	0.2310	0.2295	0.2290	0.2293	0.2305	0.2296	0.230	0.0010	0.42
Cr	0.10	0.0094	0.0093	0.0093	0.0098	0.0094	0.0095	0.0090	0.0090	0.0094	0.0090	0.009	0.0003	2.75
	0.30	0.0241	0.0236	0.0221	0.0238	0.0231	0.0226	0.0231	0.0223	0.0230	0.0231	0.023	0.0006	2.75
	0.70	0.0500	0.0500	0.0500	0.0524	0.0499	0.0511	0.0509	0.0512	0.0515	0.0504	0.051	0.0008	1.63
Cu	0.05	0.0061	0.0062	0.0064	0.0061	0.0069	0.0069	0.0061	0.0062	0.0064	0.0061	0.006	0.0003	5.00
	0.30	0.0419	0.0411	0.0402	0.0407	0.0405	0.0404	0.0399	0.0400	0.0399	0.0400	0.040	0.0006	1.58
	0.70	0.0960	0.0960	0.0960	0.0959	0.0947	0.0955	0.0952	0.0952	0.0951	0.0955	0.096	0.0005	0.48
Fe	0.10	0.0096	0.0101	0.0103	0.0100	0.0099	0.0096	0.0106	0.0099	0.0105	0.0102	0.010	0.0003	3.38
	0.50	0.0424	0.0415	0.0428	0.0427	0.0421	0.0426	0.0413	0.0430	0.0421	0.0419	0.042	0.0006	1.33
	1.00	0.0830	0.0839	0.0847	0.0834	0.0832	0.0820	0.0839	0.0838	0.0837	0.0845	0.084	0.0008	0.92
Pb	0.20	0.0078	0.0074	0.0078	0.0078	0.0076	0.0078	0.0077	0.0078	0.0077	0.0078	0.008	0.0001	1.71
	0.70	0.0278	0.0273	0.0271	0.0267	0.0270	0.0264	0.0274	0.0273	0.0269	0.0269	0.027	0.0004	1.45
	1.50	0.0551	0.0548	0.0552	0.0555	0.0547	0.0546	0.0544	0.0544	0.0549	0.0547	0.055	0.0004	0.64
Mn	0.05	0.0116	0.0107	0.0110	0.0103	0.0108	0.0108	0.0112	0.0107	0.0109	0.0108	0.011	0.0003	3.15
	0.30	0.0650	0.0649	0.0649	0.0651	0.0646	0.0649	0.0646	0.0640	0.0648	0.0648	0.065	0.0003	0.48
	0.70	0.1463	0.1465	0.1459	0.1471	0.1475	0.1474	0.1487	0.1473	0.1462	0.1468	0.147	0.0008	0.56
Ni	0.10	0.0095	0.0100	0.0096	0.0103	0.0102	0.0096	0.0100	0.0095	0.0097	0.0096	0.010	0.0003	3.04
	0.50	0.0443	0.0433	0.0438	0.0444	0.0430	0.0437	0.0444	0.0437	0.0438	0.0434	0.044	0.0005	1.09
	1.00	0.0812	0.0820	0.0834	0.0829	0.0818	0.0829	0.0831	0.0835	0.0816	0.0819	0.082	0.0008	0.99
Zn	0.05	0.0374	0.0377	0.0373	0.0377	0.0374	0.0377	0.0373	0.0371	0.0371	0.0374	0.037	0.0002	0.61
	0.30	0.1985	0.1993	0.1975	0.1992	0.1979	0.1988	0.1995	0.1985	0.1974	0.2004	0.199	0.0009	0.47
	0.70	0.4027	0.4031	0.4019	0.4021	0.4023	0.3981	0.4042	0.4025	0.3993	0.3997	0.402	0.0015	0.37

Continue 3 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 8592  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม  
5225, 5217



Request No. 25-67 / 0275

3 / 5

MTC. ACL. No. 358 / 67

## 3. Trueness

## 3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.020	0.020	0.000	1.10	± 0.005
	0.301	0.301	0.000	0.11	± 0.005
	0.707	0.693	-0.013	1.85	± 0.008

## 3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.1007	0.104	0.004	3.49	± 0.009
	0.3035	0.297	-0.006	2.11	± 0.012
	0.7071	0.685	-0.023	3.19	± 0.023

## 3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.051	0.047	-0.004	7.58	± 0.003
	0.303	0.296	-0.007	2.19	± 0.009
	0.704	0.698	-0.005	0.74	± 0.009

Continue 4 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 8592  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม  
5225, 5217





Request No. 25-67 / 0275

4 / 5

MTC. ACL. No. 358 / 67

## 3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.100	0.104	0.005	4.60	$\pm 0.014$
	0.500	0.482	-0.018	3.55	$\pm 0.016$
	1.006	0.968	-0.038	3.75	$\pm 0.029$

## 3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.201	0.202	0.001	0.34	$\pm 0.014$
	0.706	0.719	0.012	1.73	$\pm 0.030$
	1.513	1.459	-0.054	3.57	$\pm 0.061$

## 3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.0505	0.050	0.000	0.83	$\pm 0.005$
	0.3031	0.306	0.003	1.12	$\pm 0.007$
	0.7023	0.698	-0.004	0.62	

Continue 5 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 8592  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม 5225, 5217



Request No. 25-67 / 0275

5 / 5

MTC. ACL. No. 358 / 67

## 3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.101	0.098	-0.003	2.90	$\pm 0.013$
	0.508	0.502	-0.006	1.16	$\pm 0.018$
	1.012	0.962	-0.051	5.02	$\pm 0.032$

## 3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.050	0.045	-0.005	9.39	$\pm 0.013$
	0.303	0.324	0.021	7.04	$\pm 0.013$
	0.707	0.675	-0.032	4.52	$\pm 0.019$

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 ( $k = 2$ )

which gives a level of confidence of approximately 95%

Calibrated by .....  
(Mr. Atipat Ratana)Approved by .....  
(Miss Suladda Deawtong)

Director of Analytical Chemistry Laboratory

Issued Date : 11 March 2024

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

End of Certificate

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

## Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

## Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

## Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 8592  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

เอกสารไม่ควบคุม 5225, 5217



# PinAAcle 900F Preventive Maintenance Report

Company Name: UNITED ANALYST AND ENGINEERING

Instrument Location: BANGCHAK, PRAKHANONG  
BANGKOK, 10260

Instrument Serial No.: PFBS20031902

Date: 26-Jun-2023

เอกสารไม่ควบคุม

## PinAAcle 900F Preventive Maintenance (PM)

Company Name:	UNITED ANALYST AND ENGINEERING		
Address (Instrument Location):	BANGCHAK, PRAKHANONG, BANGKOK, 10260		
Serial Number:	PFBS20031902	PM Number:	2/2
Customer Name (if applicable):	K. SATIDA	Telephone Number:	095-558-0049
Customer Support Engineer Name:	K. DUANG	Service Order Number:	WO-02273773
Date PM Performed: (DD-MMM-YYYY)	Jun 26, 2023	Next PM Due Date: (DD-MMM-YYYY)	Dec 30, 2023
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

### Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

### General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

### Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved.

No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc.

Copyright © 2013 PerkinElmer, Inc.

### Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners. Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no Warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

เอกสารไม่ควบคุม



### Component List

Component / Specific Model	Serial #	Configuration Notes

### Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A
N3160156	O-Ring Kits for Sampling Introduction ( Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction ( Plastic Nebulizer)	N/A
N9301714	Replacement Acetylene Filter Cartridge	N/A
TH001022	Replacement Air Filter Cartridge	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	26-87CUI1	30-Jan-2024

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR

เอกสารไม่ควบคุม

### Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-252
N1013002	1.0A Neutral density filter	1	MG0-358
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

เอกสารไม่ควบคุม

## Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

### 7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

### 8. After PM Performance tests:

#### 8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9890	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1975	Passed

#### 8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0009	Passed

#### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

#### 8.4 D<sub>2</sub> Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	-0.0062	Passed

#### 8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Passed

#### 8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0014	Passed

#### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3467	Passed

#### 10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

### Additional Comments

#### Additional Comments Regarding the PM

### Review

*The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.*

*This PinAAcle 900F Passes ☒ Fails ☐ the preventive maintenance.*

#### Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Date:  
26-Jun-2023  
(DD-MMM-YYYY)

Authorized Customer Representative:

Date:  
26-Jun-2023  
(DD-MMM-YYYY)



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.: 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 :**  $(26 \pm 10) ^\circ\text{C}$   
**Relative Humidity :**  $(50 \pm 30) \%$   
**Calibrated by :** Tawatchai Pama  
**Approved by :** [Redacted]  
Approved Signatory  
( ) Pornthippa Tameyakul  
(✓) Unnopphol Harachai  
( ) Suwit Imjai  
**Issue Date :** 19 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.

เอกสารไม่ควบคุม



**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 %.

-o0o-

เอกสารไม่ควบคุม





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

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

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY59003411	23LM208	TPA	27 Dec 2024

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

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

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

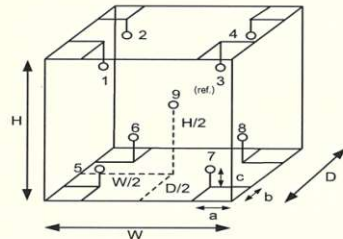
**Result of Calibration :-** ( \* ) Without Adjustment

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

**Fresh air setting :** Not Available

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>

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0-2717-3000-29 FAX. 0-2719-9484



**Cert. No.:** 23TM249  
**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 :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
 (✓) Malee Butkruea  
 ( ) Suwit Imjai

**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0051476



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2302-0297OC-1

Cert. No.: 23TM249  
Page : 2 of 3

**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

**1. Reference standard instrument:-**

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY57013711	22LM93	02 Jul 2023

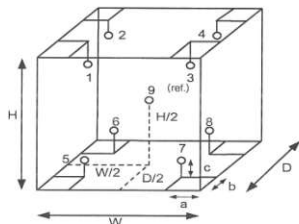
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

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

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

**Fresh air setting :** Not Available



**Probe Installation Details :**

Probe Installation Details :	Dimension of Chamber :
a = 10 cm	D = 0.62 m
b = 10 cm	W = 1.2 m
c = 10 cm	H = 1.2 m
	Capacity = 0.89 m <sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	29	31
REL.Humid. ( % )	63	67
AC Supply ( Volt )	220	220

Position :	Ref. Std. ID No.:
1	22-18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

เอกสารไม่ควบคุม

a 1149512



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2302-0297OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

Cert. No.: 23TM249  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor k
20.0	20.0	19.3	0.32	0.57	1.0	0.60	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.086	19.916	20.386	19.976	19.973	19.838	19.837	19.821	19.949

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

-o0o-

เอกสารไม่ควบคุม


a 1149512



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.: 23TW228  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 4010-2W  
Serial No. : 20260326  
ID No. : UAE.WAO.060/2563  
Received Date : 12 October 2023  
Test Date : 18 October 2023  
Reference : 2310-0451DSC-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 Sirithean  
Approved by :   
Approved Signatory  
(✓) Saithip Meangmai  
( ) Warakorn Lernagtrakul  
( ) Ponpan Paipim  
Issue Date : 18 October 2023

เอกสารไม่ควบคุม



Cert.No.: 23TW228  
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	1124013382	140RC006	23MM18	20 Feb 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.: 22M102385

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.28	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned 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

-o0o-

เอกสารไม่ควบคุม





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM192  
Page : 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Binder  
**Model :** BD 53 E2  
**Serial No. :** 13-07343  
**ID No. :** UAE.MIC.005/2558  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :**  $(26 \pm 10) ^\circ\text{C}$   
**Relative Humidity :**  $(50 \pm 30) \%$

**Calibrated by :** Suwit Imjai

**Approved by :**

Approved Signatory

( / ) Pornthippa Tameyakul  
( / ) Malee Butkruea

**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2302-0295OC-1  
**Procedure Used :-**

**Cert. No.:** 23TM192  
**Page :** 2 of 3

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

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

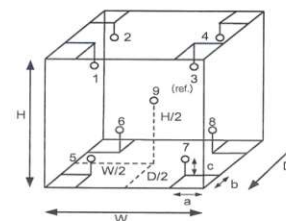
3. This certification is traceable to the International System of Unit.

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

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

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	22	23
REL.Humid. ( % )	65	61
AC Supply ( Volt )	231	231



**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.33 m  
W = 0.40 m  
H = 0.40 m  
Capacity = 0.053 m<sup>3</sup>

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

เอกสารไม่ควบคุม





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2302-0295OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 23TM192  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
35.0	35.4	35.4	0.037	0.56	0.86	0.30	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.256	35.308	35.116	35.453	34.700	34.798	34.718	34.657	34.938

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

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

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

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

**UUC\*** : Unit Under Calibration

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

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

-o0o-

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM809  
Page : 1 of 3

## Certificate of Calibration

Equipment : Incubator  
Manufacturer : Memmert  
Model : INB 400  
Serial No. : E411.1325  
ID No. : UAE.MIC.003/2555  
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 July 2023  
Calibration Date : 10 July 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Khit Ruttanaprapachai

Approved by :   
Approved Signatory

( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 20 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0056394



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0087OC-3  
Procedure Used :-

Cert. No.: 23TM809  
Page : 2 of 3

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44073381	23LM95	TPA	19 Jun 2024

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

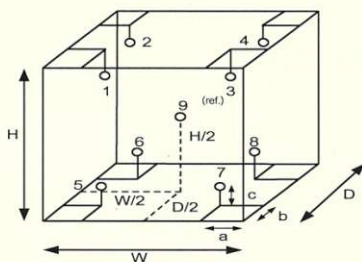
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close



**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.33 m  
W = 0.40 m  
H = 0.40 m  
Capacity = 0.053 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	23	24
REL.Humid. ( % )	51	54
AC Supply ( Volt )	220	221

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

เอกสารไม่ควบคุม

a 1172091



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0087OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 23TM809  
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
36.0	35.5	35.5	0.079	0.83	0.92	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
36.0	36.184	36.259	36.296	36.381	35.966	36.001	35.659	36.081	36.446	0.43

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 %.

-oOo-

เอกสารไม่ควบคุม

a 1172090






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.: 24TM29  
Page : 1 of 3

## Certificate of Calibration

**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 :** Krisda Malee  
**Approved by :**   
( ) Porphippa Tameyakul  
(✓) Unnopphol Harachai  
( ) Suwit Imjai  
**Issue Date :** 19 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.

เอกสารไม่ควบคุม



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

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

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	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.

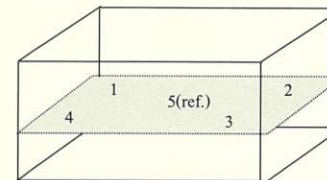
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**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

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2402-02320C-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

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

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty
			Position					
			1	2	3	4	5 (ref.)	( ± °C )
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 %.

-o0o-

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 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 : Krisda Malee  
Approved by :   
Approved Signatory  
( ) Pornthippa Tameyakul  
(✓) Unnopphol Harachai  
( ) Suwit Imjai

Issue Date : 19 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.

เอกสารไม่ควบคุม





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.

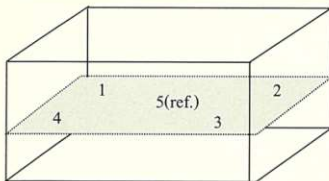
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**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

เอกสารไม่ควบคุม



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 <i>k</i>
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.

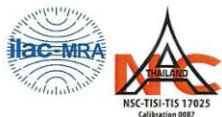
**UUC\* :** Unit Under Calibration

**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 %.

-o0o-

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

(Mr. Adisai Maknoi)

Person in charge

(Mr. Rungrod Jenkitrakulchai)

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 ดีเคเอสเอช เทคโนโลยี จำกัด  
 DKSH Technology Limited  
 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
 2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022






Certificate No.: C01234158

Page: 2 of 3

### 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 เทคโนโลยี จำกัด  
 DKSH Technology Limited  
 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
 2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand


Delivering Growth – in Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

### 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

The End of Certificate

### 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

  
(Mr. Rungrod Jenkitrakulchai)  
Authorized signatory



## 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.

## Statements of conformity:

### After 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	0.000	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



## ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00011251

ชนิดเครื่องมือ: Balance

รุ่น: PX623

หมายเลขเครื่อง: C236754745

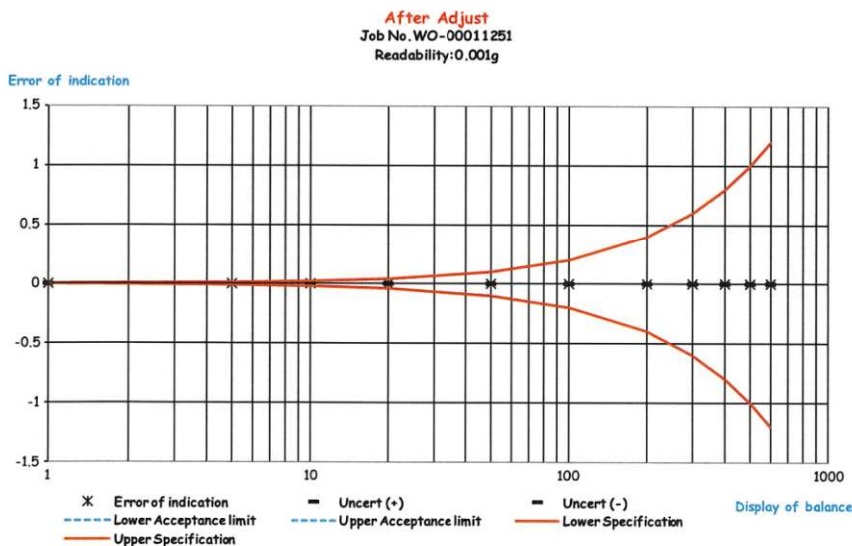
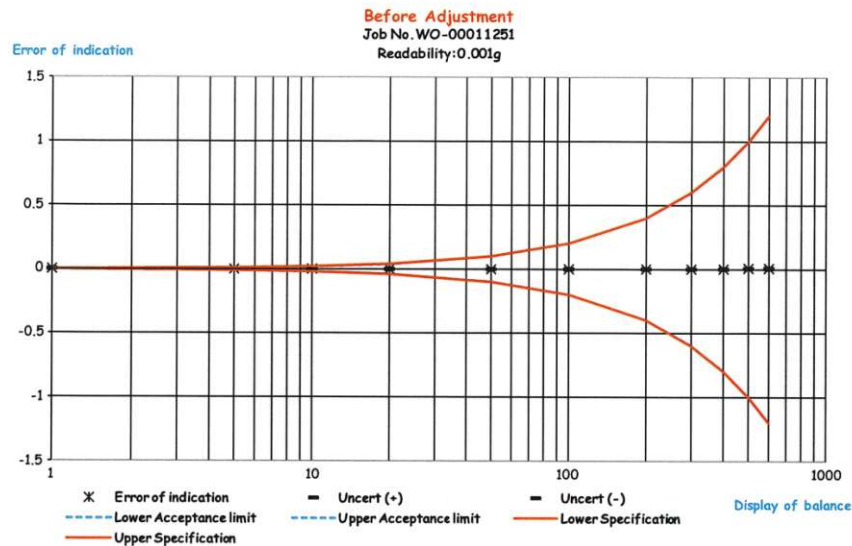
ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Dec 2023			07 Dec 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (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. การตอบสนองของปุ่มกด	<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. ชุดรองจานชั่ง (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. ความสะอาดของตัวเครื่องภายนอกและแกน 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 :

Mr. Adisai Maknoi  
Service Engineer

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม





## Certificate of Calibration

**Equipment:** Autoclave  
**Model:** CL-40L  
**Serial No. (or ID.):** 810010  
**Manufacturer:** ALP  
**Condition:** In Condition

**Certificate No.:** C11230106  
**Issued Date:** 11 June 2023  
**Job No.:** KSPR2308770  
**Page:** 1 of 4

**Customer:** United Analyst and Engineering Consultant Company Limited.  
3 Soi Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand.

**Environment Condition:** Temperature: 22 °C ± 0.8 °C  
Humidity: 58 %RH ± 4.0 %RH  
Voltage: 229 VAC ± 1.3 VAC

**Calibration Place:** United Analyst and Engineering Consultant Company Limited. (301 Room)  
3 Soi Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand.

**Calibration By:** Mr. Amornthep Phumpho

**Calibration Date:** 09 June 2023

**The Method used:** In house method, CAL-WI-18, base on BS 2646 : Part 5

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Quality reborn Co., Ltd.  
Certificate No.QR23-0086

(Mr. Amornthep Phumpho)

Person in charge

(Mr. Udon Srichana)

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 ดีเคเอส เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

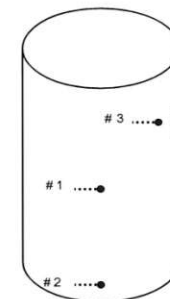
เอกสารไม่ควบคุม

CAL-FM-C11-15: 12 Sep 2022

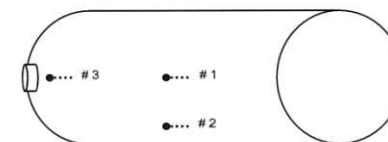


Certificate No.: C11230106

Page: 2 of 4



Vertical Vessel



Horizontal Vessel



Position of Standard

#1: Center of Chamber

#2: Temperature Sensor of UUC

#3: Exhaust port

### Standard Installation Locations

Standard Locations (#1): Geometric center of the chamber

Standard Locations (#2): Distance from temperature sensor of UUC 2 (cm.)

Standard Locations (#3): Distance from the wall 5 (cm.)

Position of Std	#1	#2	#3
Channel of Logger	4	5	6

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

บริษัท ดีเคเอส เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C11-15: 12 Sep 2022

### Calibration Results:

#### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 115.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	115.34	0.34	0.35
#2	115.43	0.43	0.35
#3	115.43	0.43	0.35

#### Temperature Distribution

Temperature			Pressure	Measured Temperature at Spread Locations			Uncertainty (± °C)*
Desired (°C)	Setting (°C)	Indicating (°C)	Indicating Mpa	#1 (°C)	#2 (°C)	#3 (°C)	
115	115	115.0	0.08	115.34	115.43	115.43	0.35

#### Chamber Characterization

Indicating Temperature (°C)	Indicating Pressure Mpa	Measured Stability (± °C)
115.0	0.08	0.15

Note: \* Maximum uncertainty of the each position

Record every 10 seconds after reaching steady state or after one achieved complete cycle.

### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 121.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	121.34	0.34	0.35
#2	121.40	0.40	0.35
#3	121.26	0.26	0.35

#### Temperature Distribution

Temperature			Pressure	Measured Temperature at Spread Locations			Uncertainty (± °C)*
Desired (°C)	Setting (°C)	Indicating (°C)	Indicating Mpa	#1 (°C)	#2 (°C)	#3 (°C)	
121	121	121.0	0.12	121.34	121.40	121.26	0.35

#### Chamber Characterization

Indicating Temperature (°C)	Indicating Pressure Mpa	Measured Stability (± °C)
121.0	0.12	0.07

Note: \* Maximum uncertainty of the each position

Record every 10 seconds after reaching steady state or after one achieved complete cycle.

The End of Certificate



## Calibration Certificate

**Certificate No.:** 2304203-001-01  
**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.:** 807298  
**ID No.:** UAE.MIC.019/2560  
**Order No.:** 2304203  
**Operation No.:** 2304203-001  
**Date of Receipt:** 10 August 2023  
**Date of Calibration:** 10 August 2023

**Calibrated by** Mr. Worapob Sooktong  
Scientist  
**Approved by** ( Mr. Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
**Date of Issue:** 15 August 2023

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.:** 2304203-001-01  
**Equipment:** Autoclave  
Model: CL-40L Serial No.: 807298  
Resolution: 1 °C ID No.: UAE.MIC.019/2560  
Manufacturer: ALP  
**Date of Calibration:** 10 August 2023

Page 2 of 3

**Location:** 301, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Environment Condition:** Ambient Temperature ( 28 ± 1 ) °C  
Relative Humidity ( 65 ± 2 ) %  
Line Voltage ( 225 ± 1 ) 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	S25601	NC-22-11-22-176	9-Nov-23	MADGETECH INC.
	HiTemp140-2	S25602	NC-22-11-22-175	9-Nov-23	MADGETECH INC.
	HiTemp140-2	R54918	TE 660383-01	8-Apr-24	NATIONAL FOOD INSTITUTE

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
- Condition of Calibrated item : Good

UUC Description : Setting program function sterilization : STERILIZE/NORMAL  
Time of sterilization 15 Minute At 121 °C

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

*Handwritten signature*

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



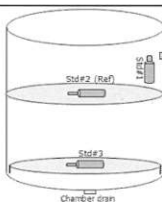


<b>Certificate No.:</b>	2304203-001-01		
<b>Equipment:</b>	Autoclave		
Model:	CL-40L	Serial No.:	807298
Resolution:	1 °C	ID No.:	UAE.MIC.019/2560
Manufacturer:	ALP		

Page 3 of 3

**Calibration result:**

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	27.0	63.5	223.3
Max	28.3	67.3	225.9



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	
121	121.68	121.70	121.66	0.66

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			
121	121	121	121	0.10	0.11	0.12	0.23

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 ถนนสุขุมวิท 36 ถนนสุขุมวิท แขวงคลองตัน เขตวัฒนา กรุงเทพมหานคร 10710 **เอกสารใน**  
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel: +66(0) 2422 8588 Fax: +66(0) 2422 8545



**Certificate No.:** 2402281-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchack, Prakanong, 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** Mr.Jerawut Prapawuttipong  
Scientist

Approved by

( Mr.Pheraphat Tuanjit )

**Manager, Division of Calibration Laboratory**

**Responsible for the Technical Management Team**

**Date of Issue:** 9 April 2024

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

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

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

2008 บะจ่างนาฬิกาสัน 36 นูนาฬิกาสัน 36 เลขทางด่วน 10700  
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel +66(0) 2422 8688 Fax +66(0) 2422 8545



## 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	R54918	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.

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
- Condition of Calibrated item : Good

UUC Description : Setting program function sterilization : STERILIZE/NORMAL  
Time of sterilization 15 Minute At 115.0 and 121.0 °C

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

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

## Calibration Report

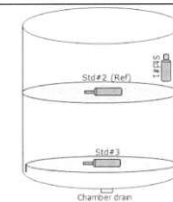
**Certificate No.:** 2402281-001-01  
**Equipment:** Autoclave  
Model: CL-40L Serial No.: 808763  
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563  
Manufacturer: ALP  
**Date of Calibration:** 2 April 2024

Page 3 of 3

**Calibration point:** 115.0 and 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

Side#1 = Attached to the load temperature probe, within 20 mm.  
Side#2 = In the upper half of the chamber  
Side#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