

ภาคผนวก ง

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เอกสารสอบเทียบเครื่องมือ

รายการใบรับรองสอบเทียบ พจนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipments (คุณภาพน้ำ)									
1	pH Meter	pH	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2301846-001-01	24 Feb 23	23 Feb 24	-
2	pH Meter		Mettler-Toledo	Seven Easy S20 / 1230525212	National Food Institute, Ministry of Industry, Thailand	2302181-001-01	24 Mar 23	22 Mar 24	-
3	BOD Incubator	Biochemical Oxygen Demand (BOD)	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	23TM249	15 Feb 23	14 Feb 24	-
4	BOD Incubator		Arco	UR-1320 / (UAE.WAO.018/2551)	Technology Promotion Association (Thailand-Japan)	23TM375	12 Apr 23	10 Apr 24	-
5	Analytical Balance (Repeatability 0.01 mg)	Suspended Solids Total Dissolved Solids	Mettler-Toledo	XSR205DU / C090071872	Technology Promotion Association (Thailand-Japan)	23MM112	26 Apr 23	24 Apr 24	-
6	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	22TM1490	19 Oct 22	18 Oct 23	-
7	Analytical Balance (Readability 0.1 mg)	Fat, Oil and Grease	Mettler-Toledo	XSR204 / C117635043	National Food Institute, Ministry of Industry, Thailand	2302827-001-01	10 May 23	8 May 24	-
8	Digestor Unit	Total Kjeldahl Nitrogen (TKN)	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	30 Mar 23	28 Mar 24	-
9	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	5874	30 Nov 21	29 Nov 22	-
10	Incubator	Total Coliform Bacteria	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	27 Apr 23	25 Apr 24	
11	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	10 Apr 24	-

รายการใบรับรองสอบเทียบ ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
12	Water Bath	Total Coliform Bacteria	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	23TM193	15 Feb 23	14 Feb 24	-
13	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	23TM194	15 Feb 23	14 Feb 24	-
14	Analytical Balance		Mettler-Toledo	MS6035 / B0070110311	Mettler-Toledo (Thailand) Ltd.	TH2058-096-040722-ACC-TH	7 Apr 22	6 Apr 23	-
15	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	23TM763	27 Apr 23	25 Apr 24	-


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

## Calibration Certificate

**Certificate No.:** 2301846-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udomsak 41, Sukhumvit Road,  
Bangchack, Prakhurang, Bangkok 10260

Page 1 of 5

**Equipment:** pH Meter  
**Manufacturer:** Mettler Toledo  
**Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210  
**ID No.:** UAE.WAT.0102553  
**Order No.:** 2301846  
**Operation No.:** 2301846-001  
**Date of Receipt:** 17 February 2023  
**Date of Calibration:** 24 February 2023

**Calibrated by** Mr.Worapob Sooklong  
**Approved by**  ( Mr.Kittaporn Niyomchart )  
Scientist  
Specialist, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
**Date of Issue:** 24 February 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.:** 2301846-001-01  
**Equipment:** pH Meter  
**Manufacturer:** Mettler Toledo  
**Serial No.:** 1231155210  
**ID No.:** UAE.WAT.0102553  
**Resolution:** 0.01 pH ; 1 mV  
**Model:** SevenEasy TM S20 pH  
**Type:** Bench top

Page 2 of 5

**Date of Calibration:** 24 February 2023

**Location:** Chemical Calibration Laboratory, National Food Institute

**Environment Condition:** Ambient Temperature: ( 23 ± 1.5 ) °C

**Condition of Equipment:** Good Condition

**Condition of this Results of Calibration**

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

2. Reference Standards / Certified Reference Material

Instrument	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fuke	28E1909	17 June 2023
2.2 Digital Thermometer	2709007	Fuke	CC-650577-01	30 October 2023
2.3 Thermo-Hygro Meter	NFL9TH 007/18	PONPE 450	CR22-0868	28 April 2023
Certified Reference Material				
2.4 pH buffer 4.005 (Primary pH buffer Solution)	832806	CPAchem	PH216.L5	8 August 2024
2.5 pH buffer 6.865 (Primary pH buffer Solution)	832807	CPAchem	PH217.L5	8 August 2024
2.6 pH buffer 10.01 (Primary pH buffer Solution)	832809	CPAchem	PH220.L5	8 August 2023
2.7 pH buffer 7.00 (Standard pH buffer Solution)	832810	CPAchem	PH107.L5	8 August 2023

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

3.1 Instruments No.2.1	through	NSC-TIS-17025 Laboratory Accreditation of Calibration No.0009
3.2 Instruments No.2.2	through	NSC-TIS-17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TIS-17025 Laboratory Accreditation of Calibration No.0022
3.4 Certified Reference Material No. 2.4 to 2.8	traceable to	Primary measurement method: Harned cell using calibrated thermopile, barometer, and reboilometer. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No.2.7	traceable to	BIH ReN HI-27 LotN 04.08.2021; BIH ReN HI-38 LotN 28.05.2021; BIH ReN HI-27 LotN 04.05.2021; BIH ReN HI-28 LotN 28.05.2021; the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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

## Calibration Report

Certificate No.: 2301846-001-01  
Equipment: pH Meter Resolution: 0.01 pH : 1 mV  
Manufacturer: Mettler Toledo Model: SevenEasy TM S20 pH  
Serial No.: 1231155210 Type: Bench top  
ID No.: UAE.WAT.0102353  
Date of Calibration: 24 February 2023  
Calibration Results:  
1. Calibration of pH Meter

( Manual Temperature Compensation at 25 °C )

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
0	414.120	414	0.00	0.58	2.00
2	285.814	286	2.00	0.58	2.00
4	177.464	178	4.00	0.58	2.00
6	58.160	59	6.00	0.58	2.00
7	0.000	0	7.00	0.58	2.00
8	-59.158	-59	8.00	0.58	2.00
10	-177.460	-177	10.00	0.58	2.00
12	-286.811	-286	12.00	0.58	2.00
14	-414.117	-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 Toledon Model: InLab Solids  
Serial No.: 5018311 ID No. N/A  
Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	186	-	0.0071	2.00
6.855	6.90	19	97.68	0.0075	2.00
10.008	10.01	-160	97.29	0.0095	2.00
6.885	6.89	15	-	0.0082	2.00

## Calibration Report

Certificate No.: 2301846-001-01  
Equipment: Digital Thermometer with RTD Resolution: 0.1 °C Model: SevenEasy TM S20 pH  
Serial No.: 1231155210 ID No.: UAE.WAT.0102353  
Manufacturer: Mettler Toledo  
Date of Calibration: 24 February 2023

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Condition: Ambient Temperature 25 °C ± 1 °C  
Relative Humidity 48 % ± 3 %  
Condition of this results of Calibration:  
1. Calibration Method : - In house method: W-TE-025 by comparison with standard thermometer.  
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 ( ITS-90 ).  
2. Reference Standard Instrument :  
Instrument Model Serial No. Certificate No. Due Date Through  
HANDHELD THERMOMETER 1523 2118154 PSL-T 0673/65 07-Jun-23 TISTR  
Platinum Resistance Thermometer (PRT) 5627A 877332  
Support Equipment : - Low Temperature Bath (Micro Bath), Model: 7103, S/N: A39538,AW65 A85181.

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



## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C  
**Model:** SevenEasy TM S20 pH  
**Serial No.:** 1231155210  
**ID No.:** UAE.WAT.010/2553  
**Manufacturer:** Mettler Toledo  
**Date of Calibration:** 24 February 2023

Page 5 of 5

**Calibration points:** 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 120 mm.

- Description of probe, model : - S/N : -

Dimension of probe : Diameter 9 mm., Length 120 mm.,

Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.015	- 0.1	0.11
25.0	25.014	0.0	0.11
35.1	35.016	- 0.1	0.11

Note

- UUC\* : Unit Under Calibration

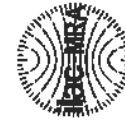
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k= 2, providing a level of confidence of approximately 95 %.

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FCS-012 Revision: 01 Date: 20-04-65



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 ศูนย์บริการและพัฒนาอุตสาหกรรม  
 Foundation for Industrial Development National Food Institute  
 Food Industrial Laboratory Service Center  
 NSC-TIS-17023  
 CALIBRATION 0061



## Calibration Certificate

**Certificate No.:** 2302181-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchack, Prakhlang, Bangkok 10260

Page 1 of 5

**Equipment:** pH Meter  
**Manufacturer:** METTLER TOLEDO  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**ID No.:** UAE.WAS.003/2553  
**Order No.:** 2302181  
**Operation No.:** 2302181-001  
**Date of Receipt:** 14 March 2023  
**Date of Calibration:** 24 March 2023

**Calibrated by** Mr.Pheraphat Tuanjit  
 Solentist  
**Approved by** [Redacted]  
 (Mr.Nutaporn Niyomchart)  
 Specialist, 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.

FCS-005 Revision: 01 Date: 20-04-65



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 Foundation for Industrial Development National Food Institute  
 Food Industrial Laboratory Service Center  
 NSC-TIS-17023  
 CALIBRATION 0061

## Calibration Report

**Certificate No.:** 2302181-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH ; 1 mV  
**Model:** SevenEasy pH  
**Type:** Bench top  
**Manufacturer:** METTLER TOLEDO  
**Serial No.:** 1230526212  
**ID No.:** UAE.WAS.003/2553

**Date of Calibration:** 24 March 2023

Page 2 of 5

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature: ( 23.4 ± 1.5 ) °C  
**Condition of Equipment:** Good Condition  
**Relative Humidity:** ( 52 ± 3 ) %

### Condition of this Results of Calibration

1. Calibration Method: In house method: W-CC-002 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        | 22E1939         | 17 June 2023      |
| 2.2 Digital Thermometer   | 2709007         | Fluke        | CC-800557-01    | 30 October 2023   |
| 2.3 Thermo-Hygro Meter    | NFI18TH00317    | PONPE        | TE 880066-01    | 21 September 2023 |
3. This calibration is traceable to The International System of Unit (SI Unit)
- | Instruments                                      | Serial / ID No. | Manufacturer | Certificate No. | Due Date         |
|--|-----------------|--------------|-----------------|------------------|
| 2.4 pH buffer 4.006 (Primary pH buffer Solution) | 873808          | CPAchem      | PH216.L5        | 18 February 2025 |
| 2.5 pH buffer 6.865 (Primary pH buffer Solution) | 873809          | CPAchem      | PH217.L5        | 18 February 2025 |
| 2.6 pH buffer 10.01 (Primary pH buffer Solution) | 873811          | CPAchem      | PH220.L5        | 18 February 2024 |
| 2.7 pH buffer 7.00 (Standard pH buffer Solution) | 873812          | CPAchem      | PH107.L5        | 18 February 2024 |
- 3.1 Instruments No.2.1 through through
- 3.2 Instruments No.2.2 through through
- 3.3 Instruments No.2.3 through through
- 3.4 Certified Reference Material No. 2.4 to 2.6 traceable to
- 3.5 Certified Reference Material No.2.7 traceable to
- NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0006  
NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0081  
NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0061  
Primary measurement method: Harmonized calibration of calibration thermometric, barometric, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
BIM Rain H-13 Lot# 25.05.2022; BIM Rain H-16 Lot# 02.06.2022; BIM Rain H-13 Lot# 25.05.2022; BIM Rain H-16 Lot# 02.06.2022, the Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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

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

F-C5-012 Revision: 01 Date: 20-04-55



## Calibration Report

**Certificate No.:** 2302181-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH ; 1 mV  
**Model:** SevenEasy pH  
**Type:** Bench top  
**Manufacturer:** METTLER TOLEDO  
**Serial No.:** 1230526212  
**ID No.:** UAE.WAS.003/2553

**Date of Calibration:** 24 March 2023

Page 3 of 5

### Calibration Results:

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

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (± mV)	Coverage Factor (k)
		mV	pH		
0	414.120	414	0.00	0.58	2.00
2	295.614	295	2.00	0.58	2.00
4	177.864	178	4.00	0.58	2.00
6	59.160	59	6.00	0.58	2.00
7	0.000	0	7.00	0.58	2.00
8	-95.158	-95	8.00	0.58	2.00
10	-177.460	-177	10.00	0.58	2.00
12	-260.811	-260	12.00	0.58	2.00
14	-414.117	-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.:** 1156883  
**ID No.:** N/A

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

Certified Value (at 25 °C pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	187	-	0.0071	2.00
6.895	6.86	22	97.66	0.0075	2.00
10.010	10.01	-160	97.65	0.0089	2.00
6.895	6.89	14	-	0.0083	2.00

F-C5-012 Revision: 01 Date: 20-04-55



## Calibration Report

**Certificate No.:** 2302181-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1230525212 ID No.: UAE.WAS.003/2553  
Manufacturer: METTLER TOLEDO  
**Date of Calibration:** 24 March 2023

Page 4 of 5

**Location:** Chemical Calibration Laboratory, National Food Institute

**Environment Condition:**  
Ambient Temperature 25 °C ± 1 °C  
Relative Humidity 55 % ± 5 %

### Condition of this results of Calibration:

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

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 660039-01	10-Dec-23	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	305	509201			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-5 Plus Basic, S/N: 341592/2

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on data and piece of calibration only.
6. Condition of Calibrated Item : Good
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

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

## Calibration Report

**Certificate No.:** 2302181-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1230525212 ID No.: UAE.WAS.003/2553  
Manufacturer: METTLER TOLEDO  
**Date of Calibration:** 24 March 2023

Page 5 of 5

**Calibration points:** 15.0, 25.0 and 30.0 °C

### Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : N/A S/N : N/A
- Dimension of probe : Diameter 3 mm., Length 120 mm.,
- Sheath material : N/A

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	14.999	- 0.2	0.12
25.2	24.999	- 0.2	0.12
30.2	29.999	- 0.2	0.12

### 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 %.

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

End





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SIAMULUANG, SIAMULUANG 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 :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$

Calibrated by : Preescha Hlahib

Approved by :   
Approved Signatory

( ) Ponthipha Tameyakul  
(✓) Malea Butkuea  
( ) Suwit Injai

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 : 2302-02970C-1

### 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.

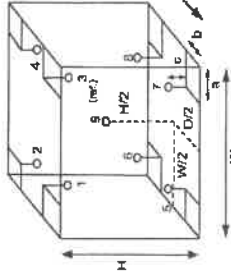
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

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



### 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>

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



**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
Measured Temperature ( °C )							
Position							
1	2	3	4	5	6	7	8
20.086	19.916	20.366	19.976	19.973	19.836	19.837	19.821
							9 (ref.)
							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-



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES**  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10350  
TEL. 0-2711-3000-29 FAX. 0-2719-9484



**Cert. No.:** 23TM375  
**Page :** 1 of 3

## Certificate of Calibration

**Equipment :** BOD Incubator  
**Manufacturer :** ARCO  
**Model :** UR-1320  
**Serial No. :** .  
**ID No. :** UAE.WAO.018/2551  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Lab Floor 2  
**Received Order :** 11 April 2023  
**Calibration Date :** 12 April 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Krisda Malee

**Approved by :**   
Approved Signatory

( ) Ponnithippa Tameyakul  
( ✓ ) Malee Buikrua  
( ) Suwit Imjai

**Issue Date :** 24 April 2023

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

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เอกสารไม่ควบคุม

ก 1149512

เอกสารไม่ควบคุม

A 0053360



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2304-0156OC-2  
Procedure Used :-

Calibration were conducted using calibration procedure CP-QT02 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

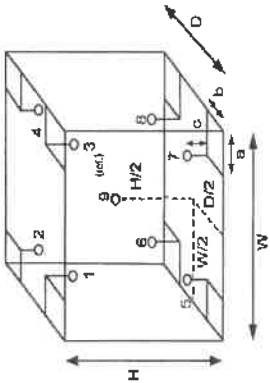
1. Reference standard instrument:-  
Instrument Model Serial No. Due Date  
1 ) Data Acquisition 34972A NY59003411 26 Nov 2023

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 :-  
Function of UUC\* : ( \* ) Without Adjustment  
Temperature Source  
Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	27
REL.Humid. ( % )	42	45
AC Supply ( Volt )	219	220



Probe Installation Details :  
a = 10 cm  
b = 10 cm  
c = 10 cm  
Dimension of Chamber :  
D = 0.82 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 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

เอกสารควบคุม  
a 1158259



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2304-0156OC-2  
Result of Calibration :-  
Function of UUC\* : ( \* ) Without Adjustment  
Temperature Source  
Fresh air setting : Not Available

Calibration were conducted using calibration procedure CP-QT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
20.0	20.0	20.0	0.48	0.42	1.2	2

Calibration Point ( °C )	Measured Temperature ( °C )								Uncertainty ( ± °C )
	1	2	3	4	5	6	7	8	
20.0	20.040	20.170	20.263	20.083	19.749	19.704	19.920	20.191	0.66

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

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

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

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

UUC\* : Unit Under Calibration

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

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

-o0o-

เอกสารควบคุม  
a 1158258



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 15, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0 2717-3000-29 FAX. 0 2719-5484



X&C-T&B-1817255  
CALIBRATION 0189

Cert.No.: 23MM112  
Page.: 1 of 3

## Certificate of Calibration

Equipment : Electronic Balance  
Manufacturer : Mettler Toledo  
Model : XSR205  
Serial No. : C009071872  
ID No. : UAE.WAO.012/2563

Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phakhanong,  
Bangkok 10280

Location : Balance Room

Received order : 26 April 2023  
Calibration Date : 26 April 2023  
Ambient Temperature : 15 °C to 40 °C  
Relative Humidity : 30 % to 80 %

Calibrated by : Man Pattanapongpaiboon

Approved by :  Approved Signatory

( ) Pormthippa Taneyakul  
( ) Matee Butkrua  
(✓) Suwit Imjai

Issue Date : 2 May 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 : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2304-0459OC-1

Procedure used :-

Calibration were conducted using in-house calibration procedures GP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:-

Instruments  
1) Standard Weight Set (S2) Model 15884  
Serial No. 24053 ID No. 70RC007 Test report No. MM-0010-22 Due date 20 Jan 2024  
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 81 g Resolution 0.00001 g  
81 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
80	80.00005	-0.00005	0.15	2.00
200	199.99999	+0.00001	0.29	2.00

After Adjustment :

1. Determining of the standard deviation of weighing machine ( n = 10 )  
Applied Weight (g)  
Standard Deviation of Reading (g)  
80 0.000007  
200 0.000000

เอกสารไม่ควบคุม



Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2304-0459OC-1

### 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

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

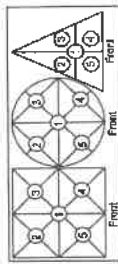
#### 3. Departure from nominal value

Applied Weight (g)	Balance		Measurement Uncertainty (± mg)	Coverage Factor (k)
	Reading (g)	Correction (g)		
Unloaded	0.00000	0.00000	0.014	2.13
0.05	0.05001	-0.00001	0.015	2.09
0.1	0.10001	-0.00001	0.015	2.09
1	1.00001	-0.00001	0.018	2.04
5	5.00003	-0.00003	0.028	2.00
20	20.00006	-0.00006	0.045	2.00
50	50.00006	-0.00006	0.080	2.00
80	80.00004	-0.00004	0.15	2.00
100	100.00000	0.00000	0.16	2.00
150	150.00000	0.00000	0.29	2.00
200	200.00000	0.00000	0.29	2.00

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

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Cert.No.: 23MM112  
Page: 3 of 3



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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0 2717 3060 27 FAX. 0 2719 9484



Cert. No.: 22TM1490  
Page : 1 of 3

## Certificate of Calibration

Equipment : Hot Air Oven  
Manufacturer : Memmert  
Model : UF 55  
Serial No. : B216.1666  
ID No. : UAE.WAO.0272559  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10260  
Lab Floor 2  
Received Order : 19 October 2022  
Calibration Date : 19 October 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$

Calibrated by : Preecha Hlanhib

Approved by :

( ) Ponthipha Tamayakul  
( ) Matee Butkruea  
(✓) Suwit Imjai

Approved Signatory

Issue Date : 31 October 2022

The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0575OC-1  
Procedure Used :-

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date  
1) Data Acquisition 34970A MY41021843 22LM/4 10 Jan 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

Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0575OC-1  
Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor k
104.0	104.0	104.0	0.061	1.3	1.7	0.42	2
140.0	140.0	140.0	0.14	2.3	2.4	1.1	2
180.0	180.0	180.0	0.21	3.5	3.5	1.3	2

Calibration Point ( °C )	Measured Temperature ( °C )							
	1	2	3	4	5	7	8	9 (ref.)
104.0	103.076	103.878	103.777	104.124	104.687	104.426	103.928	104.370
140.0	138.198	139.189	139.808	139.550	140.286	139.622	139.293	140.369
180.0	177.930	179.267	178.643	179.753	181.011	180.093	179.456	181.278

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.

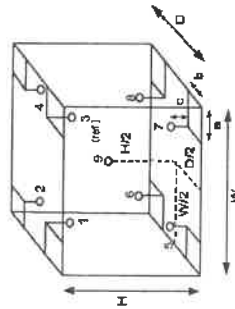
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation  
UUC\* : Unit Under Calibration

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 %.

**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>



Ref. Std. ID No.: @ Calibration Point	
Position :	( 104 ) °C ( 140,180 ) °C
1	18-04RTD-01 21-04TC-01
2	18-04RTD-02 21-04TC-02
3	18-04RTD-03 21-04TC-03
4	18-04RTD-04 21-04TC-04
5	18-04RTD-05 21-04TC-05
6	18-04RTD-06 21-04TC-06
7	18-04RTD-07 21-04TC-07
8	18-04RTD-08 21-04TC-08
9 (ref.)	18-04RTD-09 21-04TC-09

Environment during calibration	
Temp. ( °C )	Beginning 29 Finished 30
REL.Humid. ( % )	47 40
AC Supply ( Volt )	221 220



Cert. No.: 22TM1490  
Page : 2 of 3

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



## Calibration Report

**Certificate No.:** 2302827-001-01  
**Equipment:** Electronic Balance  
Model: XSR204  
Serial No.: C117635043  
Capacity: 220 g

**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.0127564

**Date of Calibration:** 10 May 2023 Page 3 of 4

**Calibration Results: (Continued)**  
**Calibration Range:** 0 - 200 g  
**Calibration Adjustment:** Internal Calibration  
**3. Departure from Nominal Value:**

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.00000	0.0000	0.0000	0.000085	2.00
0.01	0.01000	0.0100	0.0000	0.000085	2.00
0.02	0.02001	0.0200	0.0000	0.000085	2.00
0.05	0.05000	0.0500	0.0000	0.000085	2.00
0.1	0.10001	0.1000	0.0000	0.000085	2.00
0.2	0.20001	0.2000	0.0000	0.000085	2.00
0.5	0.50002	0.5000	0.0000	0.000085	2.00
1	1.00000	1.0000	0.0000	0.000086	2.00
2	2.00002	2.0000	0.0000	0.000086	2.00
3	3.00003	3.0000	0.0000	0.000087	2.00
5	5.00002	5.0000	0.0000	0.000087	2.00
10	10.00001	10.0000	0.0000	0.000088	2.00
20	20.00003	20.0000	0.0000	0.000092	2.00
30	30.00004	30.0000	0.0000	0.000098	2.00
40	40.00007	40.0000	0.0000	0.00011	2.00
45	45.00009	45.0001	0.0000	0.00013	2.00

FCS-013 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** 2302827-001-01  
**Equipment:** Electronic Balance  
Model: XSR204  
Serial No.: C117635043  
Capacity: 220 g

**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.0127564

**Date of Calibration:** 10 May 2023 Page 4 of 4

**Calibration Results: (Continued)**  
**Calibration Range:** 0 - 200 g  
**Calibration Adjustment:** Internal Calibration  
**3. Departure from Nominal Value:**

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
50	50.00003	50.0000	0.0000	0.00011	2.00
55	55.00005	55.0000	0.0000	0.00012	2.00
60	60.00004	60.0000	0.0000	0.00012	2.00
65	65.00005	65.0000	0.0000	0.00013	2.00
70	70.00006	70.0001	-0.0001	0.00013	2.00
75	75.00008	75.0002	-0.0001	0.00013	2.00
80	80.00007	80.0002	-0.0001	0.00014	2.00
85	85.00009	85.0002	-0.0001	0.00014	2.00
90	90.00010	90.0002	-0.0001	0.00015	2.00
100	100.00006	100.0002	-0.0001	0.00016	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
200	200.00016	200.0003	-0.0001	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 -----

FCS-012 Revision: 01 Date: 20-04-65



## Verification Report

Certificate No.:	2302413-001-01
Equipment:	HEATING BLOCK DIGESTION
	Model: 2520
	Serial No.: 91794469
	Resolution: 1 °C
	ID No.: UAE.WAS.011/2560
	Manufacturer: FOSS
Date of Calibration:	30-31 March 2023

Page 2 of 4

**Location:** Laboratory Room, NATIONAL FOOD INSTITUTE

Relative Humidity ( 55 ± 15 ) %

11. This instrument was calibrated by insert standard thermocouples type K into 15 heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.

- The temperature scale used was based on ITS - 90.

Instrument	Model	Serial No.	Certificate No.	Due Date
------------	-------	------------	-----------------	----------

with Thermocouple	Type R	TC#101-103 / CH#101-103	IC2270044	5-May-2023
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4. This certificate was certified only for the instrument we calibrated.

6. Condition of Calibrated item : Good

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.

ISSN: 0000-0000 Page: 20-04-55

## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
 Model: 2520      Serial No.: 91794469  
 Resolution: 1 °C      ID No.: UAE.WAS-011/2560  
 Manufacturer: FOSS

Date of Calibration:	30-31 March 2023
Calibration point:	380 °C

### Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	377.74	2.1
2	380	380	0.40	377.28	2.1
3	380	380	1.18	377.82	2.1
4	380	380	0.44	377.19	1.6
5	380	380	0.11	377.30	1.6
6	380	380	0.14	377.90	1.6
7	380	380	1.17	373.85	2.1
8	380	380	0.33	376.96	2.1
9	380	380	0.14	374.18	2.1
10	380	380	0.96	378.56	2.0
11	380	380	1.04	378.34	2.0
12	380	380	0.35	378.06	2.0
13	380	380	0.48	377.05	1.6
14	380	380	0.38	379.19	1.6
15	380	380	0.50	377.48	1.6
16	380	380	0.48	378.33	1.7
17	380	380	0.71	377.60	1.7
18	380	380	0.35	376.77	1.7
19	380	380	0.84	377.06	1.8
20	380	380	0.41	378.58	1.8

**Note:**

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

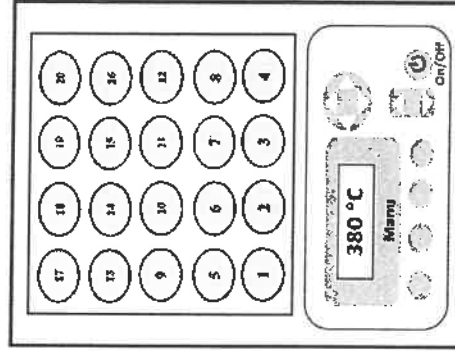
## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
 Model: 2520 Serial No.: 91794469  
 Resolution: 1 °C ID No.: UAE.WAS.011/2560  
 Manufacturer: FOSS

**Date of Calibration:** 30-31 March 2023

**Calibration point:**  
**Calibration result:**

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



### Sensor Installation Location

**Note:**

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

FCS-009 Revision: 01 Date: 20-04-15



## Customer Service Report

Date:	30/11/21
Customer:	UAE
Instrument:	K T 200

Hours Start	8.00
Finish	9.00
Travel To Customer	1

Labour	9.00
Travel From Customer	15.00

Address:	91 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Serial:	91790524

Report No:	5874
------------	------

FOSS South East Asia  
3388 Srinrat Building, 25th - 26th Floor, Unit No. 3388/50,  
Rama IV Road, Klongtoey, Klongtoey, Bangkok, Thailand 10110

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

PO/Quote Number:	
------------------	--

PMIA Type	FOSS CARE - PRO	Contract No.	
-----------	-----------------	--------------	--

Details of Work / Test		Condition / Status
- Check instrument for AT 200		Pass
- Check PM kit for AT 200		Pass
- Check Safety Valve		Pass
- Check Rubber Element		Pass
- Check Heating Element		Pass
- Check New of panel PCB		Pass
- Check Safety desc		Pass
- Check Lubricant		Pass
- Check Leak Head		Pass
- Check Solenoid set 3ml to 28ml		Pass

Part No:	Batch	Description	Qty
10009465	11235-983	Foss PM kit K T 200	1
1575024	20.07.21	Safety Valve	1
1540826	09.11.20	Rubber Element for Heating coil	2
10008512	02.04.21	Heating Element	1
10002712	11.11.20	Seal	1
10004273	16.07.20	K T 200 new panel PCB	1
10006385	22.04.21	Safety desc complete	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?	

เอกสารไม่ควบคุม

## FOSS Preventive Maintenance Protocol

FossCare™

Customer: UAE

Instrument	Kjeltec™ 2100	4.2/Dec 200
Recommended PM interval (whichever occurs first between interval and no. of samples analysed)	12 months	No. of samples analysed (if applicable):
Preventive maintenance kit (P/N)	10009965	S/N 91790524

## Introduction

A maintenance protocol provides systematic and functional means of maintaining a specific instrument type. The recommended PM interval depends on the operational conditions and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be considered. A demanding environment, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

### NOTE:

The content of this protocol is subject to change over time. In order to safeguard that you obtain the correct parts, please make sure to indicate serial no and date of installation when contacting your FOSS representative.

Dedicated Analytical Solutions

FOSS Analytical AS  
69 Slangerupgade  
DK-3400 Hillerød  
Denmark  
Tel: +45 7010 3370  
Fax: +45 7010 3371  
E-mail: support@foss.dk  
Web: www.foss.dk

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Box 70  
SE-263 21 Höganäs  
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Tel: +46 42 361 500  
Fax: +46 42 360 349  
E-mail: support@foss.dk  
Web: www.foss.dk

Customer Support, 1001 4572 / Rev. 3

1(2)

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## Maintenance Procedure

### Exchange of Parts and Cleaning

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	1000 0056	<input type="checkbox"/>
2	Replace	Non return valve	1000 3538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	1575 0093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	1582 0006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	1582 0011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	1582 0004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

### Check and Adjustments

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	๕.๘	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		120 ml	100 - 150 ml/4 min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cables and electrical connections				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTAKARACHA ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10310  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM728  
Page : 1 of 3

## Certificate of Calibration

Equipment : Incubator  
Manufacturer : Memmert  
Model : IPP 260  
Serial No. : V616.0066  
ID No. : UAE.MIC.032/2559  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10260  
Location : Microbiology Laboratory (302)  
Received Order : 27 April 2023  
Calibration Date : 27 - 28 April 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

( ) Ponthippa Tameyakul  
(✓) Mailee Buksuea  
( ) Suwit Injai

Issue Date :

11 May 2023

The Uncertainties are for a confidence probability of approximately 95 %

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

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-04810C-6  
Result of Calibration :  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 23TM728  
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
25.0	25.0	25.0	0.020	0.81	1.2	2
36.0	36.0	36.0	0.15	1.1	1.6	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.541	25.354	25.388	25.278	24.341	24.349	24.379	24.455	24.747	0.30
36.0	35.275	35.351	35.768	35.941	36.543	36.590	36.653	36.728	36.232	0.39

Average\* : The average of 30 values in each position.  
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.  
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.  
UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .  
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-04810C-6  
Procedure Used :-

Cert. No.: 23TM728  
Page : 2 of 3

Calibration was 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 : 34872A Serial No. : MY57013711 Cert. No. : 22LM83 Due Date : 02 Jul 2023

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

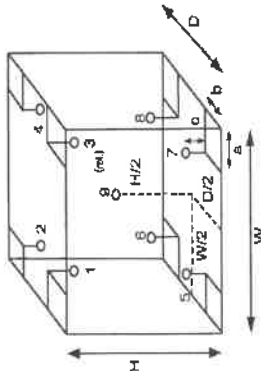
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration	
Temp. ( °C )	Beginning 25 Finished 22
REL.Humid. ( % )	76 83
AC Supply ( Volt )	231 231



Probe Installation Details :  
a = 10 cm  
b = 10 cm  
c = 10 cm  
Dimension of Chamber :  
D = 0.50 m  
W = 0.64 m  
H = 0.80 m  
Capacity = 0.26 m³

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 14, SUANLUANG, SUANLUANG UANGKOR 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM378  
Page : 1 of 3

## Certificate of Calibration

Equipment : Incubator  
Manufacturer : Memmert  
Model : IPP 260  
Serial No. : V615.0187  
ID No. : UAE.MIC.003/2559

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

Location : Microbiology Laboratory

Received Order : 11 April 2023  
Calibration Date : 12 April 2023  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$

Calibrated by : Preecha Hlaibib

Approved by :

( ) Ponthippa Taneyakul  
( ) Malee Bulkueta  
( ) Suwit Imjai

Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-01550C-1  
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 MY49001451 23LM27 25 Feb 2024

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

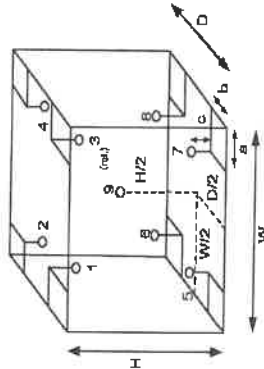
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
Temp. ( °C )	Beginning	Finished
REL.Humid. ( % )	25	26
AC Supply ( Volt )	57	61
	220	220



Probe Installation Details :  
a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm  
Dimension of Chamber :  
D = 0.50 m  
W = 0.64 m  
H = 0.80 m  
Capacity = 0.26 m<sup>3</sup>

Position	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

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**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2304-0155OC-1  
**Result of Calibration :-** ( ° ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

**Cert. No.:** 23TM378  
**Page :** 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.052	0.53	0.60	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.082	35.148	34.817	35.149	34.894	35.323	34.773	35.058	34.802	0.30

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

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

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**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES**  
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TEL. 0-2717-3000-29 FAX. 0-2719-9484



**Cert. No.:** 23TM193  
**Page :** 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNE 14  
**Serial No. :** L416.0806  
**ID No. :** UAE.MIC.002/2560

**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phra Khanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory

**Received Order :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Suwit Imjai

**Approved by :**   
( ) Pannhippa Tameyakul  
( ) Malee Bulkruea

Approved Signatory

**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95 %

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-2  
Procedure Used :-

Cert. No.: 23TM193  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 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 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.

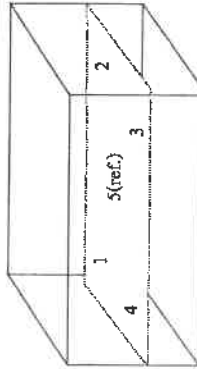
Result of Calibration :-

( \* ) Without Adjustment

Temperature Source

Function of UUC\* :

	Environmental		AC Voltage Supply ( Volt )
	( °C )	( %R.H. )	
Beginning of Calibration	22	65	231
Finished of Calibration	23	61	231



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM193  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.453	44.437	44.428	44.477	44.459

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.079	0.038	0.15	2

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

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

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

UUC\* : Unit Under Calibration

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10350  
TEL. 0-2717-3000-29 FAX. 0-2716-6484



Cert. No.: 23TM194  
Page : 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Mammert  
**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 :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Suwit Injai

**Approved by :**   
Approved Signatory

( ) Pornthipha Tameyakul  
( ) Malee Bulkrusa

**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2302-0295OC-3  
**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-Q704 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** **Model** **Serial No.** **Cert. No.** **Due Date**  
1 ) Data Acquisition 34972A MY59003411 22LM165 26 Nov 2023

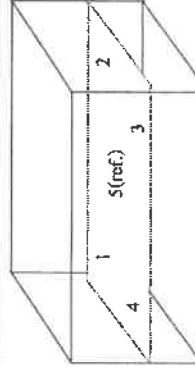
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

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

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

	Environmental		AC Voltage Supply ( Volt )
	( °C )	( %R.H. )	
Beginning of Calibration	22	65	231
Finished of Calibration	22	63	230



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295QC-3  
Result of Calibration :- ( ° ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM194  
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.6	44.520	44.509	44.498	44.552	44.530

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k	
				k	2
				44.5	0.077

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 %.

-o-o-

Calibration Certificate ID  
TH2058-058-041722-ACC-TH

Mettler-Toledo (Thailand) Ltd.  
848/4 - 846/5 Laksale Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
VT-TH.ServicesSupport@mt.com


METTLER TOLEDO



KC-18-718 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udon Suk 41, Sukhumvit Rd., Bang Chak  
City: Phra Khanong  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number:   
Contact: Sowit Chomnok

### Weighing Device

Manufacturer: Mettler-Toledo  
Model: MS803S01  
Serial No.: 30070 0311  
Building: N/A  
Floor: 2  
Room: Balance Room (206)  
Instrument Type: Weighing Instrument  
Asset Number: UAE-MC-008-2653  
Terminal Model: N/A  
Terminal Serial No.: N/A  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	620 g	0.001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v.4.0 (11/2015)  
Mettler-Toledo Work Instruction: CPM002020

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature		Humidity	
	Start: 22.8 °C	End: 23.0 °C	Start: 49.9 %	End: 58.3 %

As Found Calibration Date: 07-Apr-2022  
As Left Calibration Date: N/A  
Issue Date: 08-Apr-2022

Calibrator:

Sirawit Chomnok

Approved Signatory:

☒ Kossakorn Tassanachaisakul  
☐ Senti Jitinyom  
☐ Sureschet Sukkato

Software Version: 1.23.0.268  
Report Version: 2.18.1.1  
Form Number: F-103C

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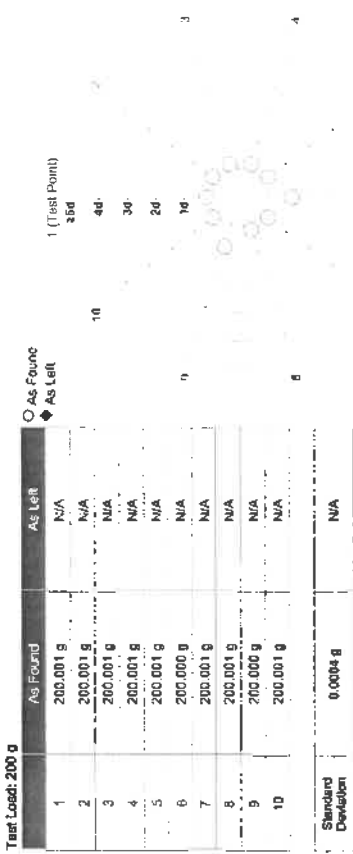
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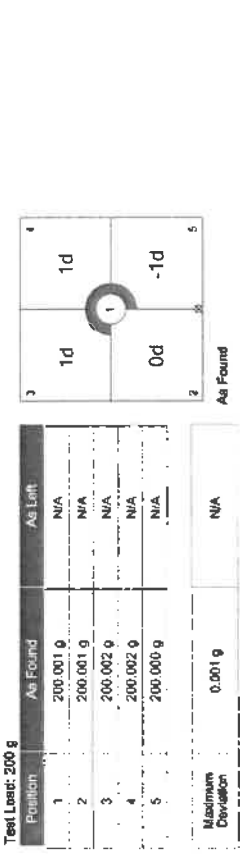
Measurement Results

Repeatability



The "d" in the graph represents the readability of the range interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity



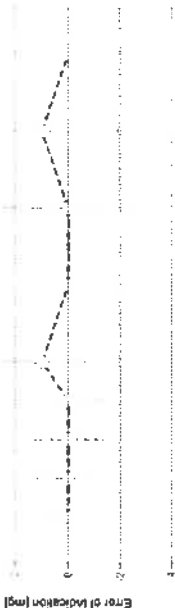
The "d" in the graph represents the readability of the range interval in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000 g	0.000 g	0.000 g	1.0 mg	2
2	0.500 g	0.500 g	0.000 g	1.2 mg	2
3	1.000 g	1.000 g	0.000 g	1.2 mg	2
4	50.000 g	50.000 g	0.000 g	1.2 mg	2
5	100.000 g	100.000 g	0.000 g	1.2 mg	2
6	150.000 g	150.000 g	0.000 g	1.5 mg	2
7	200.000 g	200.001 g	0.001 g	1.8 mg	2
8	300.001 g	300.001 g	0.000 g	2.0 mg	2
9	400.001 g	400.001 g	0.000 g	2.5 mg	2
10	500.001 g	500.002 g	0.001 g	2.5 mg	2
11	600.001 g	600.001 g	0.000 g	3.4 mg	2

O As Found

◆ As Left



For improved legibility of the graphs, only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

### Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

#### Weight Set 1: OIML F1

Weight Set No.: WS55  
Certificate Number: CCM-0137-21-C  
Date of Issue: 09-Jul-2021  
Calibration Due Date: 07-Jul-2023

#### Weight Set 2: OIML E2

Weight Set No.: WS80  
Certificate Number: C08681631  
Date of Issue: 23-Feb-2022  
Calibration Due Date: 14-Aug-2023

#### Thema Hygrometer

Equipment No.: IN161  
Certificate Number: 21H1720  
Date of Issue: 14-Jun-2021  
Calibration Due Date: 01-Jun-2022

### Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory

#### End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

### Measurement Uncertainty of the Weighing Instrument in Use

Stated as the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $3.0 \cdot 10^{-4} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use:  $3 K$

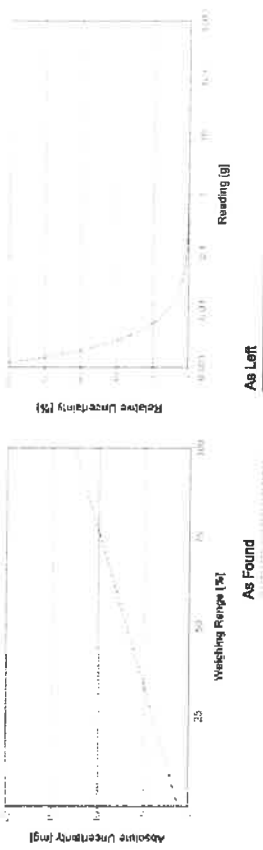
#### Linearisation of Uncertainty Equation

Range	d	Max	As Found	As Left
1	0.001 g	620 g	$U_1 = 1.2 \text{ mg} + 0.0188 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

#### Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.062 g	1.2 mg	1.9%
0.620 g	1.2 mg	0.20%
6.200 g	1.3 mg	0.021%
62.000 g	2.4 mg	0.0039%
620.000 g	13 mg	0.0021%
		N/A





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-39 FAX. 0-2719-9484



Cert. No.: 23TM763  
Page : 1 of 3

## Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 808763

ID No. : UAE MIC.026/2563

Submitted by :

United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Microbiology Laboratory (301)

Location :

Received Order : 27 April 2023

Calibration Date : 27 April 2023

Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 30) \%$

Calibrated by :

Presche Hahib

Approved by :

Approved Signatory

( ) Pornthippa Tameyakul  
( ) Malee Bulkrusa  
( ) Suwit Injai

Issue Date :

11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0053944



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-04B10C-2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument 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.

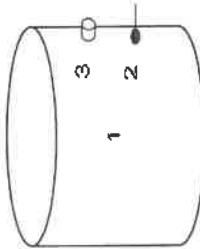
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

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

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



Environmental	
( °C )	( %R.H. ) ( Volt )
Beginning of Calibration	27 60 220
Finished of Calibration	27 58 220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-20TC-04
2 =	Temperature sensor	18-20TC-05
3 =	Exhaust port	18-20TC-06

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a 1159968



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-0461OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Operating parameter Set : Temperature = 115.0 °C  
Sterilization period = 15 minute

Cert. No.: 23TM763  
Page : 3 of 3

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
115.0	115.0	1	115.213	0.22	0.08	0.75	2
		2	115.166				
		3	115.260				

Operating parameter Set : Temperature = 121.0 °C

Sterilization period = 30 minutes

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
121.0	121.0	1	121.260	0.29	1.1	0.75	2
		2	121.224				
		3	121.284				

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

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

UUC\* : Unit Under Calibration

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

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

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a 1159967

## 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> )	Thermo Scientific	G25A 158M	Tisch Environmental, Inc.	05072022	5 Jul 22	4 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)	23P1402	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)	22P2722	22 Jul 22	21 Jul 23	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H1583	27 Jul 22	26 Jul 23	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C 42C-0508011076	UAE Consultant Co., Ltd.	18032023	18 Mar 23	17 Mar 24	-
6	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
7	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43C 43C-0611116459	UAE Consultant Co., Ltd.	07042023	7 Apr 23	6 Apr 24	-
8	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778118	UAE Consultant Co., Ltd.	06102022	6 Oct 22	5 Oct 23	-
10	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
11	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 RTHK2PDH	UAE Consultant Co., Ltd.	08022023	8 Feb 23	7 Feb 24	-
12	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUA-PH210 HA0F0026	Technology Promotion Association (Thailand-Japan)	23CH98	23 Jan 23	22 Jan 24	-





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Cert.No.: 23CH98  
Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH210  
Serial No. : HA0F0026  
ID No. : UAE.EFM.0882564(EFM.pH.01/64)  
Condition As-Received:  
Used Item  
Received Date : 20 January 2023  
Calibration Date : 23 January 2023  
Reference : 2301-0887WSC-1  
Submitted by :  
United Analyst and Engineering Consultant Co.,Ltd.  
3 Sol Udomaek 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature :  
Relative Humidity :  
Calibration Procedure :  
(25 ± 2.5) °C  
(50 ± 15) %  
In - house method :  
- CP-CH5 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagtrakul

Approved by :  
( ) Malee Buikrua  
( ) Saithip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date : 25 January 2023

The Uncertainties are for a confidence probability of approximately 95 %  
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A 0050217



Cert.No.: 23CH98  
Page.: 2 of 3

### Condition of this calibration result

1. Reference Standard Instrument :  
Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 54030049 130RC116 22E2769 24 Aug 2023  
2) Ref. Standard Thermometer 4962054 110RC044 22I1306 27 Oct 2023  
This certification is traceable to the International System of Unit maintained at:-  
- Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution Manufacturer Lot No. Exp. date  
pH 4.008 CPA chem 826598 09 July 2024  
pH 6.887 CPA chem 826598 09 July 2023  
pH 10.008 CPA chem 826590 09 July 2023

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

### Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (smV)	Coverage factor k
			mV	pH		
pH Meter S/N: HA0F0026	pH	mV				
	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

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Cert.No.: 23CH98  
Page: 3 of 3

#### Calibration Results

##### Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( $\pm$ )	Coverage factor $k$
pH Electrode S/N.: 991L0035	4.008	4.02	161	0.0088	2.05
	6.987	7.00	-11	0.011	2.00
	6.987	7.00	-11	0.011	2.00
	10.008	10.01	-187	0.0096	2.00

##### Function : Temperature Measurement

(\* ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. : 991L0035
- Dimension of probe:
  - Length : 112 mm.
  - Diameter : 16 mm.
  - Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ( $\pm$ °C)	Coverage factor $k$
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.002	35.0	-0.002	0.13	2.00

Remark : - UUC\* = Unit Under Calibration

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

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RECALIBRATION  
DUE DATE:  
July 5, 2023



## Certificate of Calibration

Calibration Certification Information			
Cal. Date: July 5, 2022	Rootmeter S/N: 438320	Ta: 297 °K	
Operator: Jim Tisch		Pa: 750.1 mm Hg	
Calibration Model #: G25A	Callibrator S/N: 158M		

Run	Vol. Init (m3)	Vol. Final (m3)	$\Delta$ Vol. (m3)	$\Delta$ Time (min)	$\Delta$ P (mm Hg)	$\Delta$ H (in H2O)
1	1	2	1	1.3240	3.2	2.00
2	3	4	1	0.9480	6.4	4.00
3	5	6	1	0.8480	7.9	5.00
4	7	8	1	0.8060	8.7	5.50
5	9	10	1	0.6670	12.7	8.00

Data Tabulation			
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Qa (x-axis)
0.9860	0.7447	1.4073	0.9957
0.9818	1.0357	1.9902	0.9915
0.9798	1.1554	2.2251	0.9895
0.9788	1.2143	2.3337	0.9884
0.9735	1.4595	2.8146	0.9831
QSTD	m= 1.96745 b= -0.05315 r= 0.99995		QA
			m= 1.23199 b= -0.03361 r= 0.99995

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

Standard Conditions	
Tstd: 298.15 °K	
Pstd: 760 mm Hg	
Key	
$\Delta$ H: callibrator manometer reading (in H2O)	
$\Delta$ P: rootmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: Slope	

RECALIBRATION	
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 5L, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30	

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

www.tisch-env.com  
TOLL FREE: (877)263-7610  
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Cert.No.: 23P1402  
Page: 2 of 2

## Certificate of Calibration

Certificate No.: 23P1402  
Page: 1 of 2

Equipment: U Tube Manometer  
Manufacturer: Oxyer  
Model: 1221-36-W/M  
Serial No.:  
ID No.: UAE EPM 1802561  
Condition As-Received: Used Item  
Received Date: 26 April 2023  
Calibration Date: 09 May 2023  
Reference: 2304-0703WSC  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1010 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

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

81 Sai Udomsuk 41, Sukhumvit Road, Bangkok,  
Phrakhetong, Bangkok 10260

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	PC-106P	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 = 4.0146283 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 Aussanee  
Issue Date: 11 May 2023

Approved Signatory: [Signature]  
[Signature] Phalinee Prabpai  
[Signature] Sura Suwanasri  
[Signature] Atsapol Panurech

Result of calibration: Without adjustment  
Function: Pressure Measurement  
Increasing Pressure  
Range: 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>O  
Scale Interval: 0.1 inH<sub>2</sub>O (The Fifth Estimate)

Applied Pressure (inH <sub>2</sub> O)	UUC Indication		AP (inH <sub>2</sub> O)	Error (inH <sub>2</sub> O)
	High-port side (inH <sub>2</sub> O)	Low-port side (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	7.00	-7.00	14.00	0.02
16.00	8.00	-8.00	16.00	0.02
18.00	9.00	-9.00	18.00	0.06
20.00	10.00	-10.00	20.00	0.06
22.00	11.00	-11.00	22.00	0.04
24.00	12.00	-12.00	24.00	0.08
26.00	13.00	-13.00	26.00	0.08
28.00	14.00	-14.00	28.00	0.08
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.02
34.00	17.00	-17.00	34.00	0.00
35.80	17.96	-17.96	35.94	0.14

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

- UUC = Unit Under Calibration

- AP = 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 %.

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B 0314242

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## Certificate of Calibration

Certificate No. : 22P2722  
Page : 1 of 2

**Equipment:** Aneroid Barometer  
**Manufacturer:** Berigo  
**Model:** -  
**Serial No.:** -  
**ID No.:** UAE-ANV.0132547  
**Condition As-Received:** Used Item  
**Received Date:** 20 July 2022  
**Calibration Date:** 22 July 2022  
**Reference:** 2207-0584WSC  
**Ambient Temperature:** ( 23 ± 2 ) °C  
**Relative Humidity:** ( 60 ± 15 ) %  
**Atmospheric Pressure:** 1010 mbar

**Submitted by:** United Analyt and Engineering Consultant Co., Ltd.

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

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

### Condition of this result of calibration

1. Reference standards instruments :

1) Standard Barometer  
**Model** DP1142 **Serial No.** 1422505046 **Certificate No.** MP-0076-22 **Due Date** 02 May 2023

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

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

4. Scale and conversion factor is 1 kPa = 7.50062 mmHg

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

**Calibrated by :** Suwit Ausarnsee  
**Issue Date :** 25 July 2022

**Approved Signatory :** { } Phalinee Prabpaijal  
{ } Sura Suwanmasri  
✓ Atapol Panurach

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Cert.No.: 22P2722  
Page: 2 of 2

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

Increasing Pressure					
Applied Pressure (mmHg)	718.46	729.33	739.95	750.22	760.90
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0
Error (mmHg)	1.54	0.67	0.15	-0.22	-2.01

Decreasing Pressure					
Applied Pressure (mmHg)	765.90	771.89	760.86	750.17	739.90
UUC* Indication (mmHg)	760.0	770.0	760.0	750.0	740.0
Error (mmHg)	-5.80	-1.99	-0.85	-0.17	0.10

The uncertainty of measurement was ± 0.24 mmHg

\* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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## Certificate of Calibration

Certificate No.: 22H1583  
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE-ANV-016/2547

Condition As-Received: Used Item

Received Date: 20 July 2022

Calibration Date: 22 July 2022

Reference: 2207-0586WSC

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

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Corporate Services 3: Equipment Calibration and Testing Services.

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Phakhanong, Bangkok 10280

Procedure used:

Calibration was conducted using in-house calibration procedure CP-HWZ 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

1) Standard Chilled Mirror Hygrometer Sensor

Model Dew Prime II

Serial No. 31863

Certificate No. 19714

Due Date 17 Sep 2022

2) Standard Humidity/Temperature Meter

Model 400

Serial No. 10240757

Certificate No. TH-0125-21

Due Date 13 Dec 2022

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 at:-

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sonchai Dumvor  
Issue Date: 03 August 2022

Approved Signatory:

☒ Chakrit Waeavanjua  
☐ Pornnipa Tameyakul  
☐ Viporn Tantiyawutti

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B 0293719



Cert. No.: 22H1583  
Page: 2 of 2

Result of Calibration:-			
Function:			
Humidity measurement			
Reference Temperature (°C)	Standard Humidity (%R.H.)	Without Adjustment Reading (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	42	1.6
25.0	60.0	63	1.8
25.0	80.0	78	2.0

Result of Calibration:-			
Function:			
Temperature measurement			
Reference Temperature (°C)	Standard Temperature (°C)	Without Adjustment Reading (°C)	Uncertainty of Measurement (±°C)
20.00	20.00	20.0	0.72
30.01	30.01	30.0	0.72
35.04	35.04	35.0	0.72
39.98	39.98	40.0	0.72

UUC\*: Unit Under Calibration

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

-00-



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B 1119777

**MULTI-POINT GAS TEST REPORT**

Test Date : Mar 18, 2023

Equipment : Gas Analyzer (NO<sub>2</sub>)  
Manufacturer : Thermo Electron Corporation

Model : 42C  
Serial Number : 42C-0508011076

**Standard Gas Concentration**

Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) 984.8 PPM  
Carbon Monoxide (CO) 980143262  
Cylinder No. :  
Expiration Date : Jun 21, 2024

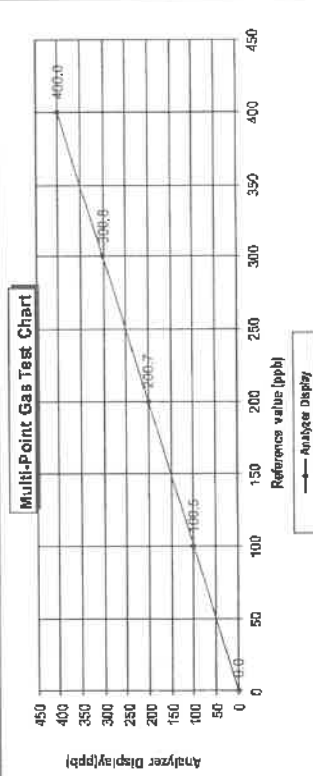
**Dilutor Detail**

Manufacturer : Thermo Scientific  
Model : 1461  
Serial Number : 1180540071

**Multi-point gas test data**

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.5	0.50	0.50	0.50
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	0.00	0.00	0.00
Average Difference (%)					0.22

Remark : Measuring Range 500.0 ppb  
Acceptable Limit  $\pm 5\%$



Calculate by

18/3/2023

Approve by

18/Mar/2023

**MULTI-POINT GAS TEST REPORT**

Test Date : Apr 7, 2023

Equipment : Gas Analyzer (SO<sub>2</sub>)  
Manufacturer : Thermo Electron Corporation

Model : 43C  
Serial Number : 43C-0511116459

**Standard Gas Concentration**

Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) 984.8 PPM  
Carbon Monoxide (CO) 980143262  
Cylinder No. :  
Expiration Date : Jun 24, 2024

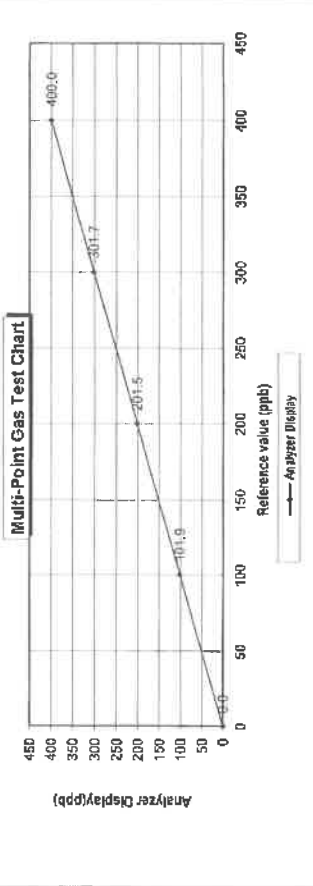
**Dilutor Detail**

Manufacturer : Thermo Scientific  
Model : 1461  
Serial Number : 1180540071

**Multi-point gas test data**

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	101.9	1.90	1.86	1.86
Level 3	40.00%	200.0	1.50	0.74	0.74
Level 4	60.00%	301.7	1.70	0.56	0.56
Level 5	80.00%	400.0	0.00	0.00	0.00
Average Difference (%)					0.63

Remark : Measuring Range 500.0 ppb  
Acceptable Limit  $\pm 5\%$



Calculate by

7/4/2023

Approve by

7/Apr/2023



United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Thailand 10260  
Tel. 0 2763 3128 Fax 0 2763 2609 www.jasaeconsultant.com E-mail: jasae@jasaeconsultant.com

## MULTI-POINT GAS TEST REPORT

Test Date : Oct 5, 2022

Equipment : Gas Analyzer (CO)  
Manufacturer : Thermo Scientific  
Model : 48i  
Serial Number : 1201778118

**Standard Gas Concentration**  
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) 984.8 PPM  
Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : E80143252  
Expiration Date : Jun 20, 2024

**Dilutor Detail**  
Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1190540071

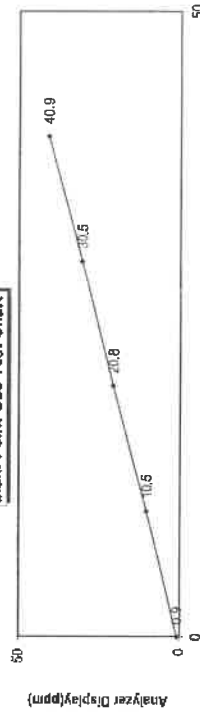
### Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.9	0.9	0.9
Level 2	20.00%	10.5	0.5	4.8	4.8
Level 3	40.00%	20.8	0.8	3.8	3.8
Level 4	60.00%	30.5	0.5	1.6	1.6
Level 5	80.00%	40.9	0.9	2.2	2.2
Average Difference (%)					2.67

Remark : Measuring Range 50.0 ppm

:Acceptable Limit  $\pm$  5%

### Multi-Point Gas Test Chart



Reference value (ppm)

Analyzer Display

Calculated by

Signature by

Oct 5, 2022

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Airgas Specialty Gases  
Airgas USA, LLC  
690 United Drive  
Durham, NC 27713  
Airgas.com

## CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: ED4N199E16A01D3  
Cylinder Number: E80143252  
Laboratory: 124 - Durham (SAP) - NC  
PGVP Number: B22021  
Gas Code: CO, NO, NO<sub>2</sub>, SO<sub>2</sub>, BALN  
Reference Number: 122-402135167-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 680  
Certification Date: Jun 21, 2021  
Expiration Date: Jun 21, 2024

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2019) document EPA 800R-12031, using the assay procedure listed. Analytical methodology does not require correction for analytical uncertainties. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration measure. All concentrations are on a methane basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NO <sub>x</sub>	45.00 PPM	45.98 PPM	G1	$\pm$ 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.98 PPM	G1	$\pm$ 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	44.68 PPM	G1	$\pm$ 1.0% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	$\pm$ 0.7% NIST Traceable	06/14/2021
NITROGEN	Balance				

### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NITROGEN	23061120	CC706058	49.82 PPM NITRIC OXIDE/NITROGEN	$\pm$ 1.0%	Feb 02, 2023
PRM	12388	D858226	9.91 PPM NITROGEN DIOXIDE/AIR	$\pm$ 2.0%	Feb 26, 2020
GMS	40142333102	CC505081	4.348 PPM NITROGEN DIOXIDE/NITROGEN	$\pm$ 2.1	Feb 18, 2023
NITROGEN	13011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	$\pm$ 0.8%	Jun 17, 2022
NITROGEN	14080118	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	$\pm$ 0.8%	Nov 16, 2025

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

### ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicoler 8700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicoler 8700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicoler 8700 AHR0801333 NO <sub>2</sub>	FTIR	Jun 03, 2021
Nicoler 8700 AHR0801333 SO <sub>2</sub>	FTIR	Jun 03, 2021

Third Data Available Upon Request

NOTE8-PC #5221002607

GROSS WT: 26.40kg

NET WT: 4.73kg



CERT 3092.01

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Approved for Release

The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

