

ภาคผนวก ฉ

เอกสารสอบเทียบเครื่องมือ

การตรวจวัดคุณภาพสิ่งแวดล้อม  
การเปลี่ยนแปลงรายละเอียดโครงการทุนผูกเรือ ท่อส่งน้ำมันใต้ทะเลและคลังน้ำมัน (ย้ายตำแหน่งที่ตั้งสถานีไฟฟ้าย่อย)  
ระหว่างเดือนกรกฎาคม-ธันวาคม พ.ศ. 2566

รายการใบรับรองสอบเทียบ ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับคุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ									
1	Turbidity Meter	ความขุ่น	Oakton	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	22CH1184	14 Sep 23	12 Sep 24	-
2	Analytical Balance (Repeatability 0.01 mg)	สารแขวนลอย	Mettler-Toledo	XSR205DU / C009071872	Calibration Laboratory Mettler-Toledo (Thailand) Limited	2102573-001-01	26 Apr 23	24 Apr 24	-
3	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	22TM1490	11 Oct 23	9 Oct 24	-
4	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	-
5	BOD Incubator		Arco	UR-1320 / (UAE.WAO.018/2551)	Technology Promotion Association (Thailand-Japan)	23TM375	12 Apr 23	11 Apr 24	-
6	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2203120-001-01	26 May 23	24 May 24	-
7	Incubator	ปริมาณโคลิฟอร์มแบคทีเรียทั้งหมด	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	27 Apr 23	26 Apr 24	-
8	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	11 Apr 24	-
9	Water Bath		Memmert	WB 14 / I401.0569	Technology Promotion Association (Thailand-Japan)	23TM1078	10 Jul 23	9 Jul 24	-
10	Water Bath		Memmert	WNB 14 / L407.0756	Technology Promotion Association (Thailand-Japan)	23TM1079	10 Jul 23	9 Jul 24	-
11	Analytical Balance		OHAUS	PX623/ C236754745	DKSH (Thailand) Ltd.	C01234158	10 Aug 22	9 Aug 23	-
12	Auto Clave		ALP	CL-40L / 810010	DKSH (Thailand) Ltd.	C11230106	9 Jun 23	8 Jun 24	-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK, 10250  
TEL: 0-2717-3009-29 FAX: 0-2719-9484

Cert.No.: 23CH1148  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Turbidity Meter  
Manufacturer : Oakton  
Model : T100IR  
Serial No. : 1120501017  
ID. No. : UAE.WAT.056/2563  
Condition As-Received: Used Item  
Received Date : 13 September 2023  
Calibration Date : 14 September 2023  
Reference : 2300-0458DSC-1  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 20) %  
Calibration Procedure : In-house method : CP-CH11  
based on direct measurement by  
using Formazin standard solution  
Calibrated by : Walalak Sinthean  
Approved by :   
Approved Signatory  
( ) Salthip Meangmai  
(✓) Warakorn Lemgagtrakul  
( ) Ponpan Paipim  
Issue Date : 15 September 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 Calibration and Testing Equipment Services.

เอกสารไม่ควบคุม

A 0011853



Cert.No.: 23CH1148  
Page.: 2 of 2

### Condition of this calibration result

1. Reference Standard Instruments :  
This certification is traceable to the International System of unit (SI unit) through:-  
- Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	1103328	130EC010	23C1361	13 June 2024
2) Electronic Balance	1124013382	140RC006	23MM18	20 Feb 2024

2. Standard Material : The Formazin suspension has been prepared gravimetric from

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

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

### Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU  
Turbidity Meter Serial Number : 1120501017

Standard Formazine suspension ( NTU )	UUC* Reading ( NTU )	Uncertainty of Measurement ( ± NTU )	Coverage Factor k
0	0.00	0.0067	2.00
20	20.3	0.39	2.00
100	101	0.76	2.00
400	401	1.5	2.05
800	800	2.1	2.23

### Remark

- UUC\* = Unit Under Calibration  
- NTU = Nephelometric Turbidity Units

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

-000-

เอกสารไม่ควบคุม

a 1179917



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3009-29 FAX: 0-2719-9484



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, Phrakhanong, Bangkok 10260  
Location : Balance Room  
Received order : 26 April 2023  
Calibration Date : 26 April 2023  
Ambient Temperature : 15 °C to 40 °C  
Relative Humidity : 30 % to 90 %  
Calibrated by : Man Pattanapongpaiboon  
Approved by :   
Approved Signatory  
( ) Pornthippa Tameyakul  
( ) Mailee Butkruea  
(✓) 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

A 0027944



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

Cert.No.: 23MM112  
Page: 2 of 3

### Procedure used :-

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

### Condition of this result of calibration

#### 1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	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	199.9999	+0.0001	0.29	2.00

### After Adjustment :

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

Applied Weight ( g )	Standard Deviation of Reading ( g )
80	0.00007
200	0.00000

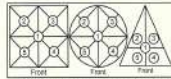
เอกสารไม่ควบคุม

a 1179917



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

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



## 2. Effect of off center loading

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

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0001	-0.0001	0.0000	-0.0001	-0.0001	0.0001

## 3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	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	0.026	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 %.

-000-

เอกสารไม่ควบคุม

4470000



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



## Calibration Certificate

Certificate No.: 2400141-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)

Manufacturer: MEMMERT

Model: UF 55

Serial No.: B216.1666

ID No.: UAE.WAO.027/2559

Order No.: 2400141

Operation No.: 2400141-001

Date of Receipt: 11 October 2023

Date of Calibration: 11 October 2023

Calibrated by: Mr.Worapob Sooktong  
Scientist

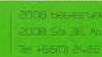
Approved by: ( Mr.Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team

Date of Issue: 16 October 2023

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

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

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



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



เอกสารไม่ควบคุม



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



## Calibration Report

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

Page 2 of 3

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

## Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E); Guidelines for Calibration and Checks of Temperature Controlled Enclosures.  
- The temperature scale used was based on ITS - 90.  
- All data show below were final values and the initial data may be obtained upon request.

## 2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 660380-01	22 April 2024	NATIONAL FOOD INSTITUTE
	RTD	CH2031-209/ RTD4201-209			

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

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

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

6. Condition of Calibrated item : Good

UUC Description :

Time of Record : 1 Hour 9 Minute At 104.0, 140.0 and 180.0 °C  
Fresh Air Damper : - Open Position -  
- Close  
- Not Available

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

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



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



เอกสารไม่ควบคุม



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



## Calibration Report

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

Page 3 of 3

Calibration point: 104.0, 140.0 and 180.0 °C

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

Table1 : Reporting of Temperature

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

Table 2 : Reporting of Characterization Result

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

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

UUC<sup>a</sup> = Unit Under Calibration

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

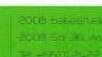
Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

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

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

----- End -----

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



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



เอกสารไม่ควบคุม





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
3344 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2715-3008-29 FAX. 0-2719-9484



Cert. No.: 23TM249  
Page : 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : Arco  
Model : UC4-1320  
Serial No. : 13URC4S013201  
ID No. : UAE.WAO.015/2561  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Lab Floor 2  
Received Order : 15 February 2023  
Calibration Date : 15 February 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Preecha Hiahib  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0051476



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

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

### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

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

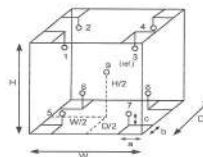
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



#### Probe Installation Details :

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

#### Dimension of Chamber :

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

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

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

เอกสารไม่ควบคุม

A 1140547



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

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

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

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

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

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

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

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

UUC\* : Unit Under Calibration

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

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

-00-

เอกสารไม่ควบคุม

a 1149512



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
3344 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2715-3008-29 FAX. 0-2719-9484



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

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : ARCO  
Model : UR-1820  
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 : Krinda Malee  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai  
Issue Date : 24 April 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 0053360



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

Cert. No.: 23TM375  
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument:-

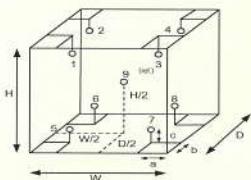
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

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

Result of Calibration :- ( ° ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



#### Probe Installation Details :

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

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

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

เอกสารไม่ควบคุม

a 1158259



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

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

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
20.0	20.0	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	9 (ref.)	
20.0		20.040	20.170	20.263	20.093	19.749	19.704	19.920	20.191	20.020	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 %.

-000-

เอกสารไม่ควบคุม

a 1158258



ศูนย์บริการและพัฒนาคุณภาพมาตรฐานอาหาร  
กรมส่งเสริมการค้าระหว่างประเทศ  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: 2303074-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: AB204-S/FACT  
Serial No.: 1129361010  
ID No.: UAE.WAS.002/2552  
Order No.: 2303074  
Operation No.: 2303074-001  
Date of Receipt: 26 May 2023  
Date of Calibration: 26 May 2023

Calibrated by Mr.Pheraphat Tuanjit  
Scientist  
Date of Issue: 29 May 2023

Approved by P. Jaenghambit  
(Miss Preeyaporn Jaengkarnkit)  
Vice President, Department of Laboratory Services  
Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%

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

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

เอกสารไม่ควบคุม



ศูนย์บริการและพัฒนาคุณภาพมาตรฐานอาหาร  
กรมส่งเสริมการค้าระหว่างประเทศ  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2303074-001-01  
Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: AB204-S/FACT  
Serial No.: 1129361010  
Capacity: 220 g  
Resolution: 0.0001 g  
ID No.: UAE.WAS.002/2552

Page 2 of 3

Date of Calibration: 26 May 2023  
Environment Condition: Ambient Temperature: 23.7 ± 0.1 °C Relative Humidity: 61 ± 2.2 %  
Place of Calibration: Room 108 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-061 In-House Method based on UKAS Lab 14 : 2015

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	890556/572	TCS	K23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 018/23	Quality Ratom	QR23-0491	21 February 2024

3. This certification is traceable to SI UNIT

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

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

#### Calibration Results:

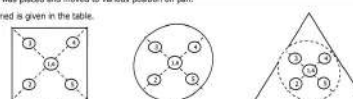
##### 1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.000048
200	0.000048

##### 2. Off-Center Error:

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

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
( g )	( g )	( g )	( g )	( g )	( g )	( g )
99.9995	99.9995	99.9995	99.9999	99.9999	99.9997	0.0003

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

เอกสารไม่ควบคุม





มูลนิธิส่งเสริมและพัฒนาวิทยาศาสตร์และเทคโนโลยี  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Report

Certificate No.: 2303074-001-01

Equipment: Electronic Balance  
Model: AB204-S/FACT  
Serial No.: 1129361010  
Capacity: 220 g

Manufacturer: METTLER TOLEDO  
Resolution: 0.0001 g  
ID No.: UAE.WAS.002/2552

Date of Calibration: 26 May 2023

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unladen	0.00000	0.0000	0.0000	0.000088	2.00
0.01	0.01000	0.0100	0.0000	0.000088	2.00
0.05	0.05000	0.0500	0.0000	0.000088	2.00
0.1	0.10001	0.0999	0.0001	0.000088	2.00
0.2	0.20001	0.1999	0.0001	0.000088	2.00
0.5	0.50002	0.5000	0.0000	0.000088	2.00
1	1.00000	1.0000	0.0000	0.000089	2.00
2	2.00002	2.0000	0.0000	0.000089	2.00
5	5.00002	5.0000	0.0000	0.000090	2.00
10	10.00001	9.9999	0.0001	0.000091	2.00
20	20.00003	20.0000	0.0000	0.000095	2.00
50	50.00003	49.9999	0.0001	0.00011	2.00
70	70.00006	69.9999	0.0002	0.00013	2.00
100	100.00006	99.9999	0.0002	0.00016	2.00
150	150.00009	149.9999	0.0002	0.00021	2.00
200	200.00016	199.9998	0.0004	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: 26-04-65

0009 ๒๕๖๓-๒๕๖๔ ๓๕ ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
0009 Soi 35, Aum Ariam Road, Bang Khun Subdistrict, Bang Khun District, Bangkok 10700, Thailand  
Tel: +662 2522 8558 Fax: +662 2522 8555

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-1000-29 FAX: 0-2719-9444



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

( ) Pornhippa Tameyakul  
(x) Malee Butkruea  
( ) Suwit Imjai

Issue Date: 11 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

๓ ๒๕๖๓๒๒



Equipment: Incubator  
Condition As-Received: Used Item  
Reference: 2304-0461OC-6  
Result of Calibration: ( ) Without Adjustment  
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)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.541	25.354	25.388	25.276	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 %.

-000-

เอกสารไม่ควบคุม

๓ ๒๕๖๓๒๒



Equipment: Incubator  
Condition As-Received: Used Item  
Reference: 2304-0461OC-6

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

Procedure Used:-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	22LM53	02 Jul 2023

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

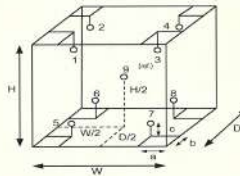
3. This certification is traceable to the International System of Unit.

Result of Calibration:- ( ) Without Adjustment

Function of UUC\*: Temperature Source

Fresh air setting: Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	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 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

๓ ๒๕๖๓๒๒



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
TEL: 0-2717-3000-29 FAX: 0-2719-4484



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 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Preecha Hlahib  
**Approved by :**   
( ) Ponthippa Tameyakul  
( ) Malee Butkrusa  
( ) Suwit Imjai  
**Issue Date :** 24 April 2023

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2304-0155OC-1  
**Procedure Used :-**

Cert. No.: 23TM378  
Page: 2 of 3

Calibration were conducted using calibration procedure CP-DT02 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.

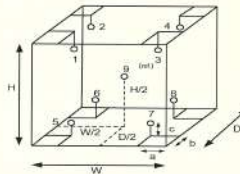
3. This certification is traceable to the International System of Unit.

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

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

**Fresh air setting :** Not Available

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

เอกสารไม่ควบคุม



**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	35.092	35.148	34.817	35.149	34.894	35.323	34.773	35.056	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 %.

-00-

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
TEL: 0-2717-3000-29 FAX: 0-2719-4484



Cert. No.: 23TM1078  
Page: 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WB 14  
**Serial No. :** 1401.0569  
**ID No. :** UAE.MIC.004/2544  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 10 July 2023  
**Calibration Date :** 10 July 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Man Pattanapongpaiboon  
**Approved by :**   
( ) Ponthippa Tameyakul  
( ) Malee Butkrusa  
( ) Suwit Imjai  
**Issue Date :** 20 July 2023

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม

A 0056395



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2307-0087OC-5  
Cert. No.: 23TM1078  
Page : 2 of 3

**Procedure Used :-**

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** **Serial No.** **Cert. No.** **Traceable** **Due Date**  
1) Data Acquisition MY59003411 Z2LM165 TPA 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.

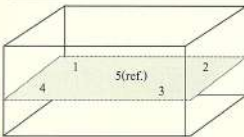
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	
Beginning of Calibration	25	58	223
Finished of Calibration	25	61	224



Front

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

Malee

เอกสารไม่ควบคุม

a 1172089



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2307-0087OC-5  
Cert. No.: 23TM1078  
Page : 3 of 3

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

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

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
41.5	41.5	41.5	41.438	41.407	41.413	41.331	41.448	0.16

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor: k
41.5	0.21	0.082	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 %.

-000-

Malee

เอกสารไม่ควบคุม

a 1172088



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534-4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-8484



Cert. No.: 23TM1079  
Page : 1 of 3

**Certificate of Calibration**

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNB 14  
**Serial No. :** L407 0756  
**ID No. :** UAE.MIC.024/2550  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 10 July 2023  
**Calibration Date :** 10 July 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Man Pattanapongpaiboon

**Approved by :**   
Approved Signatory

( ) Pornthippa Tarneyakul  
( ✓ ) Malee Bulkrues  
( ) Suwit Imjai

**Issue Date :** 20 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2307-0087OC-6  
Cert. No.: 23TM1079  
Page : 3 of 3  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
44.5	45.0	45.0	44.426	44.374	44.397	44.378	44.387	0.15
45.0	45.5	45.5	44.933	44.878	44.902	44.877	44.902	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor: k
44.5	0.084	0.040	2
45.0	0.19	0.076	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 %.

-000-

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2307-0087OC-6

Cert. No.: 23TM1079  
Page : 2 of 3

#### Procedure Used :-

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 Serial No. Cert. No. Traceable Due Date  
1) Data Acquisition MY59003411 22LM165 TPA 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.

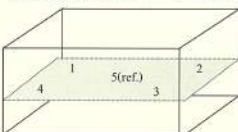
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	25	57	222
Finished of Calibration	25	58	223



Front

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

เอกสารไม่ควบคุม



Certificate No.: C01234158

Page: 2 of 3

#### Calibration Results:

##### Before Adjustment

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

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

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

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

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

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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท 41, แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certinfo-thailand

Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022



## Certificate of Calibration

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

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

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

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

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

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

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

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C0222534

Adi

(Mr. Adisai Maknoi)  
Person in charge

Rungrod

(Mr. Rungrod Jenkitrakulchai)  
Authorized signatory

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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท 41, แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certinfo-thailand

Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022



Certificate No.: C01234158

Page: 3 of 3

#### After Adjustment

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

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

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

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

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

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

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท 41, แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certinfo-thailand

Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

### Statements of conformity:

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

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

#### Tolerance and Decision rules:

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

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

(Mr. Rungrod Jenkitrakulchai)  
Authorized signatory

### Statements of conformity:

#### Before Adjustment

Readability: 0.001 g

Nominal Value g	Error of indication g	Guard band (w) g	Tolerance ( $\pm$ ) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.001	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.001	0.0013	0.200	Pass
200	0.002	0.0014	0.400	Pass
300	0.002	0.0015	0.600	Pass
400	0.003	0.0016	0.800	Pass
500	0.007	0.0019	1.000	Pass
600	0.006	0.0021	1.200	Pass

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

### Statements of conformity:

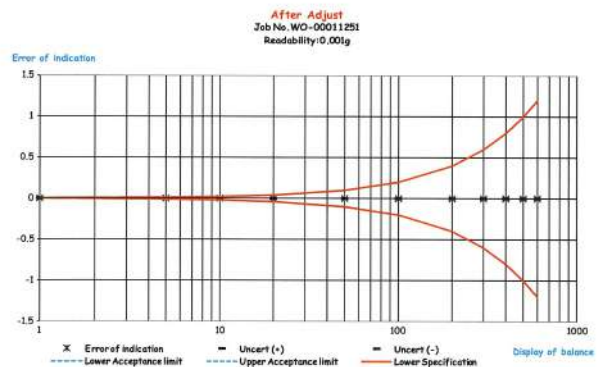
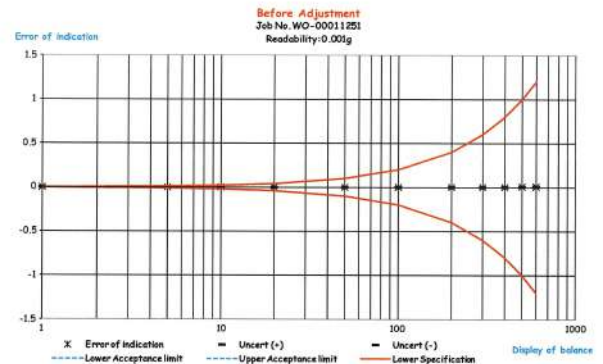
#### After Adjustment

Readability: 0.001 g

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

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

The End of Statements of conformity



## ใบตรวจสอบสภาพเครื่องชั่ง

ชนิดเครื่องมือ: Balance รุ่น: PX623 เลขที่ใบงาน: WO-00011251  
หมายเลขเครื่อง: C236754745

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

หมายเหตุผู้เพิ่มเติมนำมา :

Mr. Adisai Maknoi  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7300 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand  
Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม



## Certificate of Calibration

Equipment: Autoclave Certificate No.: C11230106  
Model: CL-40L Issued Date: 11 June 2023  
Serial No. (or ID.): 810010 Job No.: KSPR2308770  
Manufacturer: ALP Page: 1 of 4  
Condition: In Condition

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

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

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

Calibration By: Mr. Amornthep Phumpho

Calibration Date: 09 June 2023

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

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

(Mr. Amornthep Phumpho)  
Person in charge

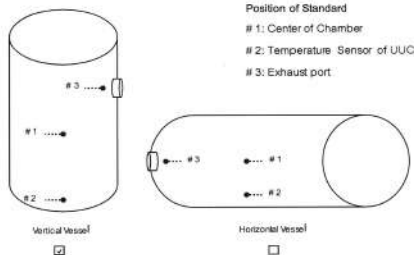
(Mr. Udon Srichana)  
Authorized signatory

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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7300 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand  
Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม  
CAL-FM-C11-15: 12 Sep 2022

Certificate No.: C11230106 Page: 2 of 4



### Standard Installation Locations

Standard Locations (#1): Geometric center of the chamber  
Standard Locations (#2): Distance from temperature sensor of UUC 2 (cm.)  
Standard Locations (#3): Distance from the wall 5 (cm.)

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

### Definitions

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

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

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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7300 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand  
Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม  
CAL-FM-C11-15: 12 Sep 2022

Certificate No.: C11230106 Page: 3 of 4

### Calibration Results:

#### Without adjustment

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

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

#### Temperature Distribution

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

#### Chamber Characterization

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

Note: \* Maximum uncertainty of the each position

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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260  
Phone: +66 2639 7300 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand  
Delivering Growth - In Asia and Beyond.

เอกสารไม่ควบคุม  
CAL-FM-C11-15: 12 Sep 2022

**Without adjustment**

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

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

**Temperature Distribution**

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

**Chamber Characterization**

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

Note: \* Maximum uncertainty of the each position

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

**The End of Certificate**