

Certificate of Calibration

Calibration Certification Information			
Cal. Date: June 22, 2020	Roots meter S/N: 438320	Ta: 296	°K
Operator: Jim Tisch		Pa: 748.3	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 158M		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3270	3.2	2.00
2	3	4	1	0.9450	6.4	4.00
3	5	6	1	0.8470	7.9	5.00
4	7	8	1	0.8040	8.7	5.50
5	9	10	1	0.6640	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)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9870	0.7438	1.4080	0.9957	0.7504	0.8895
0.9828	1.0400	1.9912	0.9914	1.0492	1.2579
0.9808	1.1579	2.2262	0.9894	1.1682	1.4064
0.9797	1.2185	2.3349	0.9884	1.2293	1.4750
0.9744	1.4675	2.8160	0.9830	1.4805	1.7789
m=		1.94592	m=		1.21850
b=		-0.03494	b=		-0.02207
r=		0.99995	r=		0.99995

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

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	roots meter 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 51, 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
FAX: (513)467-9009

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534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 21P444
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M

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.

Serial No.:
ID No.: UAE.EFM.178/2561
Condition As-Received: Used Item
Received Date: 01 February 2021
Calibration Date: 09 February 2021

Reference: 2102-0083WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1012 mbar

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

Condition of this result of calibration

- Reference standards instruments:
- 1) Pressure Calibrator Model: PC106P Serial No.: 1189 Certificate No.: MP-0113-20 Due Date: 14 Jul 2021
2. This result of calibration was made on requested at the point specified by customer.
3. Scale and conversion factor is 1 kPa = 4.0146293 inH2O
4. This instrument was used clean air as pressure media.
5. This instrument was installed in vertical orientation and center of connector was used as the reference level.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Nopparat Phongam
Issue Date: 11 February 2021

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

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B 0250404



Cert.No.: 21P444
Page: 2 of 2

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

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	0.98	-0.94	1.92	-0.08
4.00	2.02	-1.96	3.98	-0.02
6.00	3.02	-2.96	5.98	-0.02
8.00	4.02	-3.96	7.98	-0.02
10.00	5.02	-4.96	9.98	-0.02
12.00	6.02	-5.96	11.98	-0.02
14.00	7.06	-7.00	14.06	0.06
16.00	8.06	-7.98	16.04	0.04
18.00	9.06	-8.98	18.04	0.04
20.00	10.06	-9.98	20.04	0.04
22.00	11.06	-10.98	22.04	0.04
24.00	12.06	-11.98	24.04	0.04
26.00	13.08	-13.02	26.10	0.10
28.00	14.08	-14.02	28.10	0.10
30.00	15.08	-15.02	30.10	0.10
32.00	16.08	-16.04	32.12	0.12
34.00	17.10	-17.04	34.14	0.14
35.80	17.90	-17.84	35.74	-0.06

The uncertainty of measurement was ± 0.11 inH₂O
* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

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Attapol P.
เอกสารไม่ควบคุม
a 1037941



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Certificate of Calibration

Certificate No.: 21P1158
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: 111MS
Serial No.:
ID No.: UAE.EMA2.109/2552

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Condition As-Received: Used Item
Received Date: 29 March 2021
Calibration Date: 31 March 2021

Reference: 2103-1188WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar

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

Condition of this result of calibration

- Reference standards instruments:
- 1) Standard Barometer Model: DPH142 Serial No.: 1422505046 Certificate No.: MP-0053-20 Due Date: 05 Apr 2021
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 instrument was used clean air as pressure media.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suksan Khankaew
Issue Date: 31 March 2021

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

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B 0256508

Cert.No.: 21P1158
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- **Absolute Pressure Measurement**
Range: 720 mmHg to 770 mmHg
Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	718.84	728.94	739.19	749.76	760.18	770.97
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0
Error (mmHg)	1.16	1.06	0.81	0.24	-0.18	-0.97

Decreasing Pressure

Applied Pressure (mmHg)	770.93	759.94	749.49	738.89	728.63	718.81
UUC* Indication (mmHg)	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-0.93	0.06	0.51	1.11	1.37	1.19

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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a 1046644

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ISO 9001
ISO 17025
NIST-TS1-TS17025
CALIBRATION 0008

Certificate of Calibration Certificate No.: 21H802
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.003/2548
Condition As-Received: Used Item
Received Date: 29 March 2021
Calibration Date: 31 March 2021 to 08 April 2021
Reference: 2103-1189WSC
Ambient Temperature: (25 \pm 3) °C
Relative Humidity: (50 \pm 20) %

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.

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

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

Condition of this result of calibration
1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	18540	28 Jul 2021
2) Handheld Thermometer With Sensor	1521	A5A339	201968	10 Aug 2021

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: Krapop Onrat
Issue Date: 20 April 2021

Approved Signatory:
[] Chakrit Waewanjua
[] Pornthippa Tameyakul
[] Pitak Srimongkol

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B 0258329

Cert. No.: 21H802
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	39	-1.1	1.6
25.0	60.0	60	0.0	1.8
25.0	80.0	80	0.0	1.9

Result of Calibration:- Without Adjustment
Function: Temperature measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.011	20.0	-0.011	0.72
30.019	30.0	-0.019	0.72
34.989	35.5	0.511	0.72
40.006	40.0	-0.006	0.72

UUC* : Unit Under Calibration
The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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a 1051240

INNOVATIVE INSTRUMENT CALIBRATION LAB
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CALIBRATION LABORATORY
AC-0061

Page 1/2

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT
Name: CO.,LTD.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Certificate No: 21-AFM-054
Request No: Req-2021-522

Unit Under Calibration Details
Measurement Item: Mass flow meter
Manufacturer: TSI
Model: 4146
Serial Number: 41461922008
ID: UAE.EPM.224/2562
Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details
Temperature: (23 \pm 3) °C
Humidity: (55 \pm 15) %RH
Barometric Pressure: (1010 \pm 10) hpa
Received Date: 27 April 2021
Calibration Date: 8 June 2021
Calibration Procedure: In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	21151012015	Sensidyne	21 April 2022
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	21 April 2022

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

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

Calibration By:
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By:
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date: 8 June 2021

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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FM-708-AFM-01 Rev.00 Issue date: 01/07/19

Certificate No : 21-AFM-054
Request No : Req-2021-522

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
LPM	LPM	LPM	LPM	LPM
0.02	0.02003	0.024	-0.00397	0.00064
0.05	0.05005	0.053	-0.00295	0.00091
0.1	0.1006	0.101	-0.0004	0.0018
0.2	0.2006	0.198	0.0026	0.0030
0.5	0.5005	0.506	-0.006	0.008
1.0	1.002	0.988	0.014	0.015
1.7	1.702	1.675	0.027	0.025
2.0	2.003	1.971	0.032	0.029

Note
STD : Standard
UUC : Unit Under Calibration

End of Certificate

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.00 Issue date 01/07/19



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Certificate of Calibration

Certificate No. : 21P435
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : 111MS

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.

Serial No. : -
ID No. : UAE.EMA2.067/2552
Condition As-Received: Used Item
Received Date: 01 February 2021
Calibration Date: 08 February 2021

Reference: 2102-0083WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1012 mbar

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

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

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

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0053-20	05 Apr 2021
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 instrument was used clean air as pressure media.				
6. The certificate is valid only to the item calibrated on date and place of calibration.				
7. This Certification is traceable to the International System of Unit maintained at:-				
-National Institute of Metrology Thailand (NIMT)				

Calibrated by : Nopparat Phongam
Issue Date : 11 February 2021

Approved Signatory : Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

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B 0250401



Cert.No.: 21P435
Page: 2 of 2

Result of calibration:- Without adjustment

Range: 720 mmHg to 780 mmHg

Scale Interval: 1 mmHg(The Fifth Estimate)

Increasing Pressure	Applied Pressure (mmHg)	719.48	730.76	741.39	752.01	763.14	774.96	786.98
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0	
Error (mmHg)	0.52	-0.76	-1.39	-2.01	-3.14	-4.96	-6.96	

Decreasing Pressure	Applied Pressure (mmHg)	786.96	774.76	762.78	751.81	740.88	730.53	719.35
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0	
Error (mmHg)	-6.96	-4.76	-2.78	-1.81	-0.88	-0.53	0.65	

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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Attapol P.
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a 1037938



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Certificate of Calibration

Certificate No. : 21H805
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer : Barigo
Model : -
Serial No. : -
ID No. : UAE.EMA2.013/2555

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Condition As-Received: Used Item
Received Date: 29 March 2021
Calibration Date: 31 March 2021 to 08 April 2021
Reference: 2103-1189WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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

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

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

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	18540	28 Jul 2021
2) Handheld Thermometer With Sensor	1521	ASA339	201968	10 Aug 2021
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 : Kraipong Onrat
Issue Date : 20 April 2021

Approved Signatory : Chakrit Waewanjua
[x] Chakrit Waewanjua
[] Ponthippa Tameyakul
[] Pitak Srimongkol

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B 0258332



Cert. No.: 21H805
Page.: 2 of 2

Result of Calibration:-

Function:		Humidity measurement.			Without Adjustment	
Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement		
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)		
25.0	40.1	49	8.9	1.6		
25.0	60.0	60	0.0	1.8		
25.0	80.0	70	-10.0	1.9		

Result of Calibration:-

Function:		Temperature measurement.			Without Adjustment	
Standard Temperature	UUC* Reading	Error	Uncertainty of Measurement			
(°C)	(°C)	(°C)	(±°C)			
20.011	20.5	0.489	0.72			
30.019	30.0	-0.019	0.72			
34.989	35.0	0.011	0.72			
40.006	40.0	-0.006	0.72			

UUC* : Unit Under Calibration

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

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[Signature]

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a 1051237



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Cert.No.: 21CH1136
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC03345
ID No. : UAE.EFM.058/2562(ENV.pH.07/61)
Condition As-Received: Used Item
Received Date : 30 August 2021
Calibration Date : 01 September 2021
Reference : 2108-0913WSC-2
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

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

Calibrated by : Warakorn Lerngagtrakul

Approved by : *[Signature]*
Approved Signatory

(✓) Malee Butkruea
() Saitthip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 10 September 2021

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 21CH1136
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	43160066	130RC092	21E1223/1	27 Apr 2022
2) Ref. Standard Thermometer	4982054	110RC044	2011233	15 Oct 2021

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	754028	28 June 2023
pH 6.985	CPA chem	725927	12 Jan 2022
pH 10.015	CPA chem	761018	02 Aug 2022

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 (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: JC03345	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

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Cert.No.: 21CH1136
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode	4.008	4.01	164	0.0079	2.00
S/N.:210224SIA605377	6.985	7.00	-10	0.0099	2.00
	6.985	7.00	-10	0.0093	2.00
	10.015	10.01	-186	0.013	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 210224SIA605377
Dimension of probe;
- Length : 108 mm.
- Diameter : 12 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	25.003	25.0	-0.003	0.20	2.00
30.0	30.002	30.0	-0.002	0.20	2.00
35.0	30.000	30.0	0.000	0.20	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 %.

-000-

เอกสารไม่ควบคุม



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Certificate

Certificate No.: 2102572-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Order No.: 2102572

Operation No.: 2102572-001

Date of Receipt: 26 April 2021

Date of Calibration: 26 April 2021

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

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 26 April 2021 Page 2 of 5

Environment Condition: Ambient Temperature: 22.0 \pm 0.2 °C Relative Humidity: 48 \pm 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class E2 1-500mg 15880 TCS M20111955 28 November 2021

Standard Weight Class E2 1-500g 15882 TCS M20111965 28 November 2021

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter PMPF 490 NFI.BTH 004/18 Quality Return QR21-0300 15 February 2022

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 Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000000
200	0.000042

2. Off-Center Error:

A mass of 50 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)
50.0001	50.0001	50.0001	50.0002	50.0002	50.0001	0.0001

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Report

Certificate No.: 2102572-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 26 April 2021 Page 3 of 5

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 (\pm g)	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.49999	0.5000	0.0000	0.000083	2.00
1	0.99999	1.0000	0.0000	0.000086	2.00
2	1.99999	2.0000	0.0000	0.000084	2.00
5	4.99998	5.0000	0.0000	0.000084	2.00
10	10.00003	10.0000	0.0000	0.00011	2.00
15	15.00001	15.0000	0.0000	0.00012	2.00
20	20.00004	20.0000	0.0000	0.00013	2.00
30	30.00006	30.0001	0.0000	0.00015	2.00
40	40.00000	40.0001	-0.0001	0.00014	2.00
50	49.99999	50.0002	-0.0002	0.00015	2.00
70	70.00003	70.0002	-0.0002	0.00019	2.00
100	99.99997	100.0003	-0.0003	0.00020	2.00
150	149.99997	150.0004	-0.0004	0.00027	2.00
200	199.99999	200.0005	-0.0005	0.00043	2.00

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01

Equipment:

Model: AB204-S/FACT

Serial No.: 8108115858

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g

ID No.: UAE.AIR.016/2555

Date of Calibration: 26 April 2021

Page 4 of 5

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Standard Weight Class E2 1-500mg 15880 TCS M20111955 28 November 2021

Standard Weight Class E2 1-500g 15882 TCS M20111965 28 November 2021

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter PONPE 490 NFI.BTH 004/18 Quality Reborn QR21-0300 15 February 2022

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: (Calibration with filter pan)

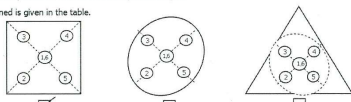
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
10	0.0000
20	0.0000

2. Off-Center Error:

A mass of 5 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)
5.0000	5.0002	5.0001	5.0001	5.0000	5.0000	0.0002

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-001-01

Equipment:

Model: AB204-S/FACT

Serial No.: 8108115858

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g

ID No.: UAE.AIR.016/2555

Date of Calibration: 26 April 2021

Page 5 of 5

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

3. Departure from Nominal Value: (Calibration with filter pan)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unload	0.00000	0.0000	0.0000	0.000082	2.00
0.01	0.01000	0.0100	0.0000	0.000082	2.00
0.05	0.05000	0.0500	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.49999	0.5000	0.0000	0.000083	2.00
1	0.99999	1.0000	0.0000	0.000086	2.00
2	1.99999	2.0000	0.0000	0.000084	2.00
3	2.99998	3.0000	0.0000	0.000087	2.00
4	3.99999	4.0000	0.0000	0.000085	2.00
5	4.99998	5.0000	0.0000	0.000084	2.00
10	10.00003	10.0000	0.0000	0.00011	2.00
15	15.00001	15.0000	0.0000	0.00012	2.00
20	20.00004	20.0000	0.0000	0.00013	2.00

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

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2102572-002-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address:

3 Soi Udomsuk 41, Sukhumvit Road,

Bangchack, Prakanhong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XP6

Serial No.: B322373893

ID No.: UAE.AIR.019/2556

Order No.: 2102572

Operation No.: 2102572 -002

Date of Receipt: 26 April 2021

Date of Calibration: 26 April 2021

Calibrated by Mr.Manas Somsak

Expert

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Responsible for the Technical Management Team

Date of Issue: 29 April 2021

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 is valid only for the purpose stated and is not to be used for any other purpose without the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-002-01

Equipment:

Model: XP6

Serial No.: B322373893

Capacity: 6.1 g

Manufacturer: METTLER TOLEDO

Resolution: 0.000001 g

ID No.: UAE.AIR.019/2556

Date of Calibration: 26 April 2021

Page 2 of 3

Environment Condition: Ambient Temperature: 22.0 ± 0.2 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (306), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class E2 1-500mg 8308068554 TCS M21010975 12 January 2022

Standard Weight Class E2 1-500g 8308068128 TCS M21010985 13 January 2022

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter PONPE 490 NFI.BTH 004/18 Quality Reborn QR21-0300 15 February 2022

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:

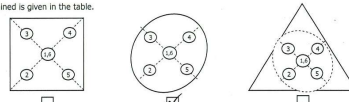
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
3	0.0000042
6	0.0000032

2. Off-Center Error:

A mass of 2 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)
1.99997	1.99996	1.99997	1.99996	1.99996	1.99998	0.00002

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2102572-002-01

Equipment: Electronic Balance
 Model: XPS
 Serial No.: 8322373893
 Capacity: 6.1 g

Manufacturer: METTLER TOLEDO
 Resolution: 0.00001 g
 ID No.: UAE.AIR.019/2556

Date of Calibration: 26 April 2021

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0 - 6 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor (k)
Unload	0.000000	0.000000	0.000000	0.00000087	2.00
0.01	0.010002	0.010000	0.000002	0.00000332	2.00
0.05	0.050004	0.050000	0.000004	0.0000047	2.00
0.10	0.100000	0.099998	0.000002	0.0000056	2.00
0.15	0.150004	0.150000	0.000004	0.0000072	2.00
0.17	0.170007	0.170004	0.000003	0.0000079	2.00
0.20	0.200002	0.200000	0.000002	0.0000065	2.00
0.50	0.499999	0.499998	0.000001	0.000011	2.00
1.00	1.000005	1.000004	0.000001	0.000014	2.00
1.50	1.500004	1.500004	0.000000	0.000016	2.00
2.00	2.000006	2.000005	0.000001	0.000014	2.00
3.00	3.000011	3.000007	0.000004	0.000018	2.00
4.00	4.000014	4.000009	0.000005	0.000021	2.00
4.50	4.500013	4.500008	0.000005	0.000024	2.00
5.00	5.000002	5.000000	0.000002	0.000018	2.00
6.00	6.000007	5.999988	0.000019	0.000029	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 -----

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Certificate

Substitute for Certificate No.: 2103272-001-01
 Certificate No.: 2103272-001-02
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
 Address: 3 Soi Udumsuk 41, Sukhumvit Road,
 Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter

Manufacturer: HANNA INSTRUMENTS

Model: HI2020-02

Serial No.: C0051107

ID No.: UAE.WAO.005/2557

Order No.: 2103272

Operation No.: 2103272-001

Date of Receipt: 11 June 2021

Date of Calibration: 14 June 2021

Calibrated by Mr.Manas Somsak
 Expert

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

Date of Issue: 2 July 2021

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-011 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103272-001-02

Equipment: pH Meter
 Resolution: 0.01 pH ; 0.1 mV
 Manufacturer: HANNA INSTRUMENTS
 Model: HI2020-02
 Serial No.: C0051107
 Type: Bench top
 ID No.: UAE.WAO.005/2557

Date of Calibration: 14 June 2021

Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: Ambient Temperature: (23.7 ± 1.5) °C Relative Humidity: (53.5 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method In house method : W-CO-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	SCL-20F-0682	17 June 2021
2.2 Digital Thermometer	2709007	Fluke	CC 630609-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH4003/17	PONPE	QR20-1578	21 September 2021

Certified Reference Material	Lot No.	Manufacturer	Ref No.	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	710048	CPAchem	PH216.L5	2 October 2022
2.5 pH buffer 5.865 (Primary pH buffer Solution)	710049	CPAchem	PH217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107.L5	2 October 2021

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

- 3.1 Instruments No.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
- 3.2 Instruments No.2.2 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
- 3.3 Instruments No.2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
- 3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method: Harned cell using calibrated thermometer, barometer, and nanoviscometer. 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 BSM ReN Hi-T LoN 30.04.2020, BSM ReN Hi-L LoN 28.05.2020, BSM ReN Hi-S LoN 30.04.2020, BSM ReN Hi-10 LoN 28.05.2020, 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.

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Report

Certificate No.: 2103272-001-02

Equipment: pH Meter
 Resolution: 0.01 pH ; 0.1 mV
 Manufacturer: HANNA INSTRUMENTS
 Model: HI2020-02
 Serial No.: C0051107
 Type: Bench top
 ID No.: UAE.WAO.005/2557

Date of Calibration: 14 June 2021

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		
0.00	414.118	415.7	0.00	0.063	2.00
2.00	295.811	297.3	2.00	0.063	2.00
4.00	177.461	179.0	4.00	0.063	2.00
6.00	59.160	60.7	6.00	0.063	2.00
7.00	0.000	1.5	7.00	0.063	2.00
8.00	-59.158	-57.7	8.00	0.063	2.00
10.00	-177.461	-176.0	10.00	0.063	2.00
12.00	-295.812	-294.4	12.00	0.063	2.00
14.00	-414.118	-412.4	14.00	0.063	2.00

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

Equipment: pH Electrode
 Manufacturer: HANNA INSTRUMENTS
 Serial No.: 076743
 Type: Combined Electrode
 Model: HI11310
 ID No.: N/A

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	162.7	99.1	0.0071	2.00
6.866	6.87	-4.9		0.0075	2.00
6.866	6.87	-4.9		0.0075	2.00
10.008	10.01	-181.3	95.0	0.0093	2.00
6.885	7.00	-13.6		0.0093	2.00

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Report

Certificate No.: 2103272-001-02
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C **Model:** SevenEasy pH
Serial No.: C0051107 **ID No.:** UAE.WAO.005/2557
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 14 June 2021 **Page 4 of 5**

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature 24 °C ± 1 °C
 Relative Humidity 54 % ± 2 %

Condition of this results of Calibration:

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

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 640028-01	12-Dec-21	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

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

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103272-001-02
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C **Model:** SevenEasy pH
Serial No.: C0051107 **ID No.:** UAE.WAO.005/2557
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 14 June 2021 **Page 5 of 5**

Calibration point: 15.0, 25.0 and 35.0 °C **
Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 100 mm.
 - Description of probe, model : HI11310 S/N : 078743
 Dimension of probe : Diameter 4 mm., Length 118 mm.,
 Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.13
25.1	24.999	-0.1	0.13
35.2	34.999	-0.2	0.13

Remark: Edited Model from edge to HI2020-02.

Note

- UUC* : Unit Under Calibration
- NFI Laboratory is not accredited ISO/IEC 17025 for calibration. In the scope marked with **

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: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2103189-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Order No.: 2103189
Operation No.: 2103189-002
Date of Receipt: 9 June 2021
Date of Calibration: 14 June 2021

Calibrated by Mr.Manas Somsak **Approved by** (Mr.Pheraphat Tuanjit)
 Expert Manager, Division of Calibration Laboratory
Date of Issue: 15 June 2021 **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: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103189-002-01
Equipment: pH Meter **Resolution:** 0.01 pH : 1 mV
Manufacturer: METTLER TOLEDO **Model:** SevenEasy pH
Serial No.: 1231155210 **Type:** Bench top
ID No.: UAE.WAT.010/2553

Date of Calibration: 14 June 2021 **Page 2 of 5**

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (23.7 ± 1.5) °C **Relative Humidity:** (53.5 ± 6) %
Condition of Equipment: Good Condition

Condition of this Results of Calibration

- Calibration Method In house method : W-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)
- Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fuke	SCL-20F-0682	17 June 2021
2.2 Digital Thermometer	2709007	Fuke	CC 630609-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH00317	PONPE	QR20-1578	21 September 2021

Certified Reference Material	Lot No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	710048	CPAchem	PH216L5	2 October 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	710049	CPAchem	PH217L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH220L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107L5	2 October 2021

- This certification is traceable to The International System of Unit (SI Unit)
 - Instruments No.2.1 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
 - Instruments No.2.2 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
 - Instruments No.2.3 through NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
 - Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method: Hanna cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
 - Certified Reference Material No. 2.7 traceable to BIM RefH Hi-7 Loth 30.04.2020; BIM RefH Hi-8 Loth 28.05.2020; BIM RefH Hi-8 Loth 30.04.2020; BIM RefH Hi-10 Loth 28.05.2020; The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103189-002-01
 Equipment: pH Meter
 Resolution: 0.01 pH ; 1 mV
 Manufacturer: METTLER TOLEDO
 Model: SevenEasy pH
 Serial No.: 1231155210
 Type: Bench top
 ID No.: UAE.WAT.010/2553

Date of Calibration: 14 June 2021 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		
0.00	414.118	414	0.00	0.58	2.00
2.00	295.811	296	2.00	0.58	2.00
4.00	177.461	178	4.00	0.58	2.00
6.00	59.160	59	6.00	0.58	2.00
7.00	0.000	0	7.00	0.58	2.00
8.00	-59.158	-59	8.00	0.58	2.00
10.00	-177.461	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.118	-414	14.00	0.58	2.00

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

Equipment: pH Electrode
 Manufacturer: METTLER TOLEDO
 Serial No.: 115882
 Type: Combined Electrode
 Model: InLab Solids
 ID No.: N/A

Performance of Electrode system (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	185	99.9	0.0071	2.00
6.866	6.87	16		0.0075	2.00
8.866	6.87	16		0.0075	2.00
10.008	10.01	-166	98.0	0.0093	2.00
9.985	6.99	9	-	0.0093	2.00

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103189-002-01
 Equipment: Digital Thermometer with RTD (pH Meter)
 Resolution: 0.1 °C
 Model: SevenEasy pH
 Serial No.: 1231155210
 ID No.: UAE.WAT.010/2553
 Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: Ambient Temperature 24 °C ± 1 °C
 Relative Humidity 54 % ± 2 %

Condition of this results of Calibration:

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

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A65997	TE 640028-01	12-Dec-21	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

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

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103189-002-01
 Equipment: Digital Thermometer with RTD (pH Meter)
 Resolution: 0.1 °C
 Model: SevenEasy pH
 Serial No.: 1231155210
 ID No.: UAE.WAT.010/2553
 Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 25 mm.
- Description of probe, model : InLab Solids S/N : 115882
- Dimension of probe : Diameter 6 mm., Length 25 mm.,
- Sheath material : Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.13
25.1	24.999	-0.1	0.13
35.1	34.999	-0.1	0.13

Note

- UUC* : Unit Under Calibration

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

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM366
 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,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Lab Floor 2
 Received Order : 22 February 2021
 Calibration Date : 23 February 2021
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Preecha Hlahib

Approved by :
 Approved Signatory

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

Issue Date : 3 March 2021

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2102-0757OC-1
 Procedure Used :-

Cert. No.: 21TM366
 Page.: 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

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

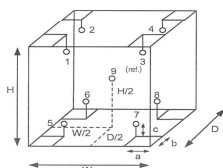
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	66	69
AC Supply (Volt)	220	220

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2102-0757OC-1
 Result of Calibration :-
 Function of UUC* : Temperature Source

Cert. No.: 21TM366
 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	19.4	0.38	0.64	1.1	0.61	2

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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK, 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM812
 Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. : -

ID No. : UAE.WAO.006/2553

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 : 21 April 2021

Calibration Date : 21 April 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Khit Ruttanaprapachai

Approved by :

() Pongthipha Tameyakul
 () Malco Butkruea
 () Suwit Imjai

Issue Date : 5 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม

A 0027601



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2104-0024OC-4
 Procedure Used :-

Cert. No.: 21TM812
 Page.: 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	20LM7	NIST, NIMT	18 May 2021

2. This certification is traceable to the SI unit.

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

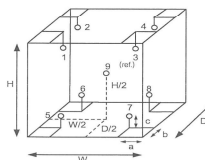
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	47	51
AC Supply (Volt)	221	222

Position :	Ref. Std./ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (ref.)	18-18RTD-09

เอกสารไม่ควบคุม

a 1052719



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2104-0024OC-4
 Result of Calibration : (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 21TM812
 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	19.8	0.37	0.39	1.0	0.58	2

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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เอกสารไม่ควบคุม

a 1052718



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
 Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Certificate

Certificate No.: 2200708-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udumsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AX 105 DR
Serial No.: 1122100406
ID No.: UAE.WAO.004/2546
Order No.: 2200708
Operation No.: 2200708-001
Date of Receipt: 24 November 2021
Date of Calibration: 24 November 2021

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: 30 November 2021

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: 00 Date: 14-12-61

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National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
 Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Report

Certificate No.: 2200708-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AX 105 DR
Resolution: 0.00001 g/ 0.0001 g
Serial No.: 1122100406
ID No.: UAE.WAO.004/2546
Capacity: 110 g

Date of Calibration: 24 November 2021 **Page 2 of 4**

Environment Condition: Ambient Temperature: 22.0 ± 0.5 °C Relative Humidity: 39 ± 1 %

Place of Calibration: 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-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M20111955	28 November 2021
Standard Weight Class E2	1-500g	15882	TCS	M20111965	28 November 2021

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	asav.khl. BTH 003/55	Quality Reform	QR21-0297	15 February 2022

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 Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
15	0.0000057
30	0.0000084
50	0.000053
100	0.000048

2. Off-Center Error:

A mass of 50 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)
50.0000	50.0000	49.9999	50.0000	49.9999	49.9999	0.0001

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
 Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



Calibration Report

Certificate No.: 2200708-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AX 105 DR
Resolution: 0.00001 g/ 0.0001 g
Serial No.: 1122100406
ID No.: UAE.WAO.004/2546
Capacity: 110 g

Date of Calibration: 24 November 2021 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0-100 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 30 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.000000	0.000000	0.000000	0.0000089	2.00
0.01	0.009998	0.010000	0.000000	0.000011	2.00
0.02	0.019997	0.020000	0.000000	0.000012	2.00
0.05	0.050001	0.050000	0.000000	0.000011	2.00
0.1	0.100002	0.100000	0.000000	0.000012	2.00
0.2	0.200004	0.200000	0.000000	0.000013	2.00
0.5	0.499994	0.500000	-0.000001	0.000014	2.00
1	0.999986	1.000000	-0.000001	0.000026	2.00
2	1.999989	1.999988	0.000001	0.000019	2.00
5	4.999979	4.999988	0.000000	0.000022	2.00
10	10.000026	9.999994	0.000009	0.000074	2.00
20	20.000037	19.999991	0.000013	0.000099	2.00
30	30.000063	30.000000	0.000066	0.00013	2.00

เอกสารไม่ควบคุม

F-CS-012 Revision: 00 Date: 14-12-61

Calibration Report

Certificate No.: 2200708-001-01

Equipment: Electronic Balance
Model: AX 105 DR
Serial No.: 1122100406
Capacity: 110 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.004/2546

Date of Calibration: 24 November 2021 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 0-100 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 31 - 100 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
40	40.00000	39.9999	0.0001	0.00014	2.00
45	44.99998	44.9999	0.0001	0.00015	2.00
50	49.99999	49.9999	0.0001	0.00016	2.00
55	54.99997	54.9998	0.0002	0.00016	2.00
60	60.00002	59.9999	0.0001	0.00018	2.00
65	65.00000	64.9999	0.0001	0.00018	2.00
70	70.00003	69.9999	0.0001	0.00019	2.00
75	75.00001	74.9999	0.0001	0.00020	2.00
80	80.00005	79.9998	0.0003	0.00021	2.00
85	85.00003	84.9998	0.0002	0.00022	2.00
90	89.99999	89.9998	0.0002	0.00021	2.00
100	99.99997	99.9998	0.0002	0.00020	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: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM1876
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B216.1666
ID No. : UAE.WAO.027/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong,
 Bangkok 10260
Location : Lab Floor 2
Received Order : 29 October 2021
Calibration Date : 29 October 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kunchit Promprat
Approved by : 
 Approved Signatory
 () Pornthipna Tamayakul
 () Malee Butkruea
 () Suwit Imjai

Issue Date : 4 November 2021

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.

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2110-0701OC-1
Cert. No.: 21TM1876
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) 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	MY44067817	21LM10	20 Jul 2022

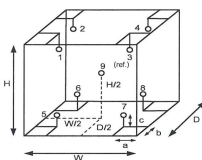
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	56	55
AC Supply (Volt)	230	230

Ref. Std. ID No. : @ Calibration Point		
Position :	(140, 180) °C	(104) °C
1	21-15TC-01	15RTD2/11
2	21-15TC-02	15RTD2/12
3	21-15TC-03	15RTD2/13
4	21-15TC-04	15RTD2/14
5	21-15TC-05	15RTD2/15
6	21-15TC-06	15RTD2/20
7	21-15TC-07	15RTD2/17
8	21-15TC-08	15RTD2/18
9 (ref.)	21-15TC-09	15RTD2/19

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2110-0701OC-1
Cert. No.: 21TM1876
Page: 3 of 3

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	0.11	0.52	0.72	0.42	2
140.0	140.0	140.0	0.25	1.1	1.4	1.1	2
180.0	180.0	180.0	0.18	0.87	1.2	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.852	103.978	104.382	104.323	103.776	104.015	104.312	104.196	103.907
140.0	140.309	140.730	140.426	140.270	139.531	139.666	140.067	139.895	139.750
180.0	180.598	180.339	180.755	180.619	179.716	179.829	180.204	180.365	179.975

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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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2103270-001-01
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.: 2103270

Operation No.: 2103270-001

Date of Receipt: 11 June 2021

Date of Calibration: 11 June 2021

Calibrated by Mr.Yothin Charoensuk
Scientist

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

Date of Issue: 15 June 2021

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: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103270-001-01
Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Resolution: 0.0001 g
Serial No.: 1129361010
ID No.: UAE.WAS.002/2552
Capacity: 220 g

Page 2 of 3

Date of Calibration: 11 June 2021

Environment Condition: Ambient Temperature: 21.1 ± 0.4 °C Relative Humidity: 48 ± 4 %

Place of Calibration: Laboratory, united analyst and engineering consultant co.,ltd.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**
Standard Weight Class E2 1mg to 200g 8505567572 TCS M20040405 20 April 2022

Instrument **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**
Thermo-Hygro Meter PONPE 490 NFLBTH 004/18 Quality Reborn QR21-0300 15 February 2022

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:

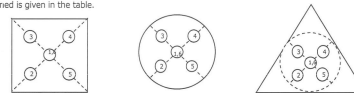
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000067
200	0.000057

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
50.0000	49.9999	49.9999	50.0000	50.0000	50.0000	0.0001

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103270-001-01
Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Resolution: 0.0001 g
Serial No.: 1129361010
ID No.: UAE.WAS.002/2552
Capacity: 220 g

Date of Calibration: 11 June 2021

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.00000	0.00000	0.00000	0.000092	2.00
0.01	0.01000	0.01000	0.00000	0.000092	2.00
0.05	0.05000	0.05000	0.00000	0.000092	2.00
0.1	0.10001	0.10000	0.00000	0.000093	2.00
0.2	0.20001	0.20001	-0.00001	0.000093	2.00
0.5	0.50001	0.50000	0.00000	0.000093	2.00
1	1.00001	1.00000	0.00000	0.000093	2.00
2	2.00002	2.00001	-0.00001	0.000093	2.00
5	5.00002	4.99999	0.00001	0.000094	2.00
10	10.00001	9.99999	0.00001	0.000096	2.00
20	20.00003	20.00000	0.00000	0.00010	2.00
50	50.00004	50.00000	0.00000	0.00012	2.00
70	70.00007	70.00000	0.00000	0.00014	2.00
100	100.00009	100.00000	0.00000	0.00016	2.00
150	150.00013	150.00000	0.00000	0.00021	2.00
200	200.00016	200.00001	0.00000	0.00028	2.00

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP21-015 **Page 1 of 5**

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

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

Location of calibration Laboratory 315

Equipment : Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009


ID No. : N/A


Received Date : 29 May 2021

Calibration Date : 29 May 2021

Issue Date : 30 May 2021

Condition of Instrument : Used

Calibrated by : 
(Mr.Tanawat Rittidach)

Approved by : 
(Miss Chonthicha Sangneng)
Quality Manager


The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

FM-510-02 R03 11/03/201

เอกสารไม่ควบคุม

DQE Services

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



DQE
CALIBRATION ISO 17025

REPORT OF CALIBRATION

Certificate No. : SP21-015Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 50 ± 15 %RH

Calibration method : In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	11/7/2021
Absorbance Standard set	25757	80105	11/7/2021
Wavelength Standard set	25806	80103	11/7/2021
Wavelength Standard set	25758	80104	11/7/2021

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

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 90 nm/min

Scan Interval of UUC : 0.15 nm.


Resolution of UUC : Photometric 0.0001 Abs.
Wavelength 0.1 nm.

FM-510-02 R03 11/03/201

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CALIBRATION ISO 17025

REPORT OF CALIBRATION

Certificate No. : SP21-015Page 3 of 5

Wavelength Accuracy :


CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.19	2.00
279.45	279.5	-0.05	0.19	2.00
287.81	287.9	-0.09	0.19	2.00
334.06	333.8	0.26	0.19	2.00
360.93	360.5	0.43	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.3	0.36	0.19	2.00
460.02	459.8	0.22	0.19	2.00
536.59	536.7	-0.11	0.19	2.00
637.98	638.4	-0.42	0.19	2.00
431.38	430.9	0.48	0.19	2.00
472.50	472.5	0.00	0.19	2.00
513.47	513.4	0.07	0.19	2.00
528.88	529.2	-0.32	0.19	2.00
573.17	573.5	-0.33	0.19	2.00
585.35	584.8	0.55	0.20	2.00
684.40	684.9	-0.50	0.19	2.00
740.72	740.4	0.32	0.19	2.00
748.55	749.0	-0.45	0.19	2.00
807.03	807.1	-0.07	0.19	2.00
879.28	879.4	-0.12	0.19	2.00

FM-510-02 R03 11/03/201

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CALIBRATION ISO 17025

REPORT OF CALIBRATION

Certificate No. : SP21-015Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0042	2.00
	0.5791	0.5767	0.0024	0.0042	2.00
	1.0488	1.0444	0.0044	0.0042	2.00
	2.1914	2.1841	0.0073	0.0092	2.00
440	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5618	0.5609	0.0009	0.0042	2.00
	1.0260	1.0244	0.0016	0.0042	2.00
	2.1259	2.1159	0.0067	0.0091	2.00
465	0.0000	0.0000	0.0000	0.0042	2.00
	0.5240	0.5212	0.0028	0.0042	2.00
	0.9639	0.9632	0.0007	0.0042	2.00
	1.9788	1.9717	0.0071	0.0091	2.00
546.1	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5194	0.5184	0.0010	0.0042	2.00
	0.9991	0.9991	0.0000	0.0042	2.00
	1.9970	1.9911	0.0059	0.0093	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5517	0.0006	0.0042	2.00
	1.0810	1.0802	0.0008	0.0042	2.00
	2.0369	2.0293	0.0076	0.0092	2.00
635	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5596	0.5593	0.0003	0.0042	2.00
	1.0513	1.0505	0.0008	0.0042	2.00
	1.9268	1.9217	0.0051	0.0092	2.00

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CALIBRATION ISO 17025

REPORT OF CALIBRATION

Certificate No. : SP21-015Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0001	-0.0001	0.0075	2.00
	0.7498	0.7438	0.0060	0.0075	2.00
257	0.0000	0.0000	0.0000	0.0075	2.00
	0.8712	0.8647	0.0065	0.0075	2.00
313	0.0000	0.0000	0.0000	0.0075	2.00
	0.2920	0.2900	0.0020	0.0075	2.00
350	0.0000	0.0000	0.0000	0.0075	2.00
	0.6459	0.6428	0.0031	0.0075	2.00

Remark : - UUC = Unit Under Calibration
- N/A = Not Available
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,
which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

FM-510-02 R03 11/03/201

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