

## ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

## List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUA-PH210 HA0C0025	Technology Promotion Association (Thailand-Japan)	21CH788	16 Jun 21	15 Jun 22	-
2	DO Meter	DO	Horiba	LAQUA-DO210 HE9M0048	Technology Promotion Association (Thailand-Japan)	21TW127	17 Jun 21	16 Jun 22	-

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

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Ambient</b>									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Thermo Scientific	G25A 158M	Tisch Environmental,Inc.	22062020	22 Jun 20	21 Jun 22	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	21P663	10 Nov 21	9 Nov 22	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21P2502	21 Jul 21	20 Jul 22	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21H803	8 Apr 21	7 Apr 22	-
5	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1180540065	UAE Consultant Co.,Ltd.	09112021	9 Nov 21	8 Nov 22	-
6	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1180540066	UAE Consultant Co.,Ltd.	09112021	9 Nov 21	8 Nov 22	-
7	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1180540067	UAE Consultant Co.,Ltd.	09112021	9 Nov 21	8 Nov 22	-
8	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1201778111	UAE Consultant Co.,Ltd.	14062021	14 Jun 21	13 Jun 22	-
9	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01QC	30 Jul 19	30 Jul 22	-
10	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200906880	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497730	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497732	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-

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

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Ambient</b>									
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497733	UAE Consultant Co.,Ltd.	30112021	30 Nov 21	29 Nov 22	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01QC	30 Jul 19	30 Jul 22	-
15	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DT0058	Envir Service Co., Ltd.	25032022	25 Mar 22	24 Mar 23	-
16	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DT0065	Envir Service Co., Ltd.	25032022	25 Mar 22	24 Mar 23	-
17	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DT0072	Envir Service Co., Ltd.	25032022	25 Mar 22	24 Mar 23	-
18	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DT0102	Envir Service Co., Ltd.	25032022	25 Mar 22	24 Mar 23	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	SvanteK	SV35 44792	Innovative Instrument Co.,Ltd.	21-ACT-188	28 May 21	27 May 22	-
20	Sound Level Meter	L <sub>Aeq</sub> 24 hours, L <sub>Aeq</sub> 1 hour, L <sub>Aeq</sub> 5 minutes, L <sub>A90</sub> L <sub>Amax</sub> , Annoyance Noise	Larson Davis	LxT2 0005394	Innovative Instrument Co.,Ltd.	22-ACT-034	21 Jan 22	20 Jan 23	-
21	Sound Level Meter	L <sub>Aeq</sub> 24 hours, L <sub>Aeq</sub> 1 hour, L <sub>Aeq</sub> 5 minutes, L <sub>A90</sub> L <sub>Amax</sub> , Annoyance Noise	Larson Davis	LxT2 0005396	Innovative Instrument Co.,Ltd.	22-ACT-105	11 Feb 22	10 Feb 23	-
22	Sound Level Meter	L <sub>Aeq</sub> 24 hours, L <sub>Aeq</sub> 1 hour, L <sub>Aeq</sub> 5 minutes, L <sub>A90</sub> L <sub>Amax</sub> , Annoyance Noise	Larson Davis	LxT2 0005398	Innovative Instrument Co.,Ltd.	22-ACT-035	21 Jan 22	20 Jan 23	-
23	Sound Level Meter	L <sub>Aeq</sub> 24 hours, L <sub>Aeq</sub> 1 hour, L <sub>Aeq</sub> 5 minutes, L <sub>A90</sub> L <sub>Amax</sub> , Annoyance Noise	Larson Davis	LxT2 0005400	Innovative Instrument Co.,Ltd.	22-ACT-036	21 Jan 22	20 Jan 23	-
24	Sound Level Meter	L <sub>Aeq</sub> 24 hours, L <sub>Aeq</sub> 1 hour, L <sub>Aeq</sub> 5 minutes, L <sub>A90</sub> L <sub>Amax</sub> , Annoyance Noise	Larson Davis	LxT2 0005402	Innovative Instrument Co.,Ltd.	22-ACT-103	11 Feb 22	10 Feb 23	-

**รายการใบรับรองสอบเทียบ ทวนสอบเครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์**

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
<b>เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพอากาศ</b>									
1	Analytical Balance (Resolution 0.1 mg)	ฝุ่นละอองขนาดไม่เกิน 10 ไมครอน เฉลี่ย 24 ชั่วโมง	Mettler-Toledo	AB204-S / 1128312528	National Food Institute, Ministry of Industry, Thailand	2200704-001-01	24 Nov 21	23 Nov 22	-
2	Analytical Balance (Resolution 0.1 mg)	ฝุ่นละอองรวมเฉลี่ย 24 ชั่วโมง	Mettler-Toledo	AB204-S/FACT / B108115858	National Food Institute, Ministry of Industry, Thailand	2102572-001-01	26 Apr 21	25 Apr 22	-
<b>เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ</b>									
3	pH Meter	ความเป็นกรดและด่าง อุณหภูมิ	Hanna Instrument	HI2020-02 / C0051107	National Food Institute, Ministry of Industry, Thailand	2103272-001-02	14 Jun 21	13 Jun 22	-
4	pH Meter		Mettler-Toledo	Seven Easy S20 / 123052512	National Food Institute, Ministry of Industry, Thailand	2202093-001-01	16 Mar 22	15 Mar 23	-
5	Turbidity Meter	ความขุ่น	Oakton	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	21CH1017	17 Aug 21	16 Aug 22	-
6	UV-VIS Spectrophotometer	ความขุ่น ไนเตรด	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP21-015	29 May 21	28 May 22	-
7	UV-VIS Spectrophotometer	ฟอสเฟต	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-
8	UV-VIS Spectrophotometer		Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP22-008	20 Jan 22	19 Jan 23	-
9	Analytical Balance (Repeatability 0.01 mg)	ของแข็งทั้งหมด	Mettler-Toledo	XSR205DU / C009071872	Calibration Laboratory Mettler-Toledo (Thailand) Limited	2102573-001-01	26 Apr 21	25 Apr 22	-
10	Hot Air Oven		Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	21TM813	21 Apr 21	20 Apr 22	-

**รายการใบรับรองสอบเทียบ ทวนสอบเครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์**

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
<b>เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์สำหรับคุณภาพน้ำ</b>									
11	Electronic Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2103270-001-01	11 Jun 21	10 Jun 22	-
12	BOD Incubator	ความสกปรกในรูปสารอินทรีย์	Arco	UC4-1320 / (UAE.LAB.015/2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
13	BOD Incubator		Arco	UR-1320 / (UAE.LAB.018/2551)	Technology Promotion Association (Thailand-Japan)	21TM811	21 Apr 21	20 Apr 22	-
14	Incubator (Cooled Incubator)	แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	20TM706	21 Apr 21	20 Apr 22	-
15	Incubator (Cooled Incubator)		Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	21TM1874	28 Oct 21	27 Oct 22	-
16	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	22TM334	17 Feb 22	16 Feb 23	-
17	Water Bath		Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	21TM708	21 Apr 21	20 Apr 22	-
18	Analytical Balance		Mettler-Toledo	MS603S / B0070110311	National Food Institute, Ministry of Industry, Thailand	2200705-001-01	24 Nov 21	23 Nov 22	-
19	Auto Clave		ALP	CL-40L / 802664	Technology Promotion Association (Thailand-Japan)	22TM89	17 Feb 22	16 Feb 23	-

Due Date of Calibration\* : กำหนดตามแผนการสอบเทียบประจำปี อย่างน้อยปีละ 1 ครั้ง



# Certificate of Calibration

Calibration Certification Information			
Cal. Date:	June 22, 2020	Rootsmeter S/N: 438320	Ta: 296 °K
Operator:	Jim Tisch		Pa: 748.3 mm Hg
Calibration Model #:	G25A	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
QSTD		m= 1.94592	QA		m= 1.21850
		b= -0.03494			b= -0.02207
		r= 0.99995			r= 0.99995

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

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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484

## Certificate of Calibration

Certificate No.: 21P663  
Page: 1 of 2

Equipment:	U Tube Manometer	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.
Manufacturer:	Dwyer	
Model:	1221-36-W/M	
Serial No.:	-	
ID No.:	UAE.EMA2.055/2555	
Condition As-Received:	Used Item	
Received Date:	04 November 2021	
Calibration Date:	10 November 2021	
Reference:	2102-0063WSC	Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature:	( 23 ± 2 ) °C	81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
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

#### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC105P	1189	MP-0113-21	14 Jul 2022

- This result of calibration was made on requested at the point specified by customer.
- Scale and conversion factor is 1 kPa = 4.0146293 inH2O
- This instrument was used clean air as pressure media.
- This instrument was installed in vertical orientation and center of connector was used as the reference level.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certification is traceable to the International System of Unit maintained at:- National Institute of Metrology Thailand (NIMT)

Calibrated by: Noppapat Phongam  
Issue Date: 11 November 2021

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

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Cert.No.: 21P663  
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 (inH2O)	High-port side (inH2O)	Low-port side (inH2O)	ΔP (inH2O)	Error (inH2O)
0.00	0.00	0.00	0.00	0.00
2.00	1.02	-1.02	2.04	0.04
4.00	1.98	-1.98	3.96	-0.04
6.00	2.98	-2.98	5.96	-0.04
10.00	4.98	-4.98	9.96	-0.04
12.00	6.00	-5.98	11.98	-0.02
14.00	7.02	-6.98	14.00	0.00
16.00	8.02	-8.00	16.02	0.02
18.00	9.04	-9.00	18.04	0.04
20.00	10.04	-10.00	20.04	0.04
22.00	11.06	-11.00	22.06	0.06
24.00	12.06	-12.00	24.06	0.06
26.00	13.06	-13.00	26.06	0.06
28.00	14.06	-14.02	28.08	0.06
30.00	15.06	-15.02	30.08	0.06
32.00	16.06	-16.02	32.08	0.06
34.00	17.06	-17.02	34.08	0.06
36.00	17.98	-17.92	35.90	0.10

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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## Certificate of Calibration

Certificate No.: 21P2502  
Page: 1 of 2

Equipment:	Aneroid Barometer	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.
Manufacturer:	Barigo	
Model:	-	
Serial No.:	-	
ID No.:	UAE.ANV.151/2550	
Condition As-Received:	Used Item	
Received Date:	20 July 2021	
Calibration Date:	21 July 2021	
Reference:	2107-0570WSC	Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature:	( 23 ± 2 ) °C	81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Relative Humidity:	( 50 ± 15 ) %	
Atmospheric Pressure:	1009 mbar	

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P16, 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-0053-21	08 Apr 2022

- This instrument was installed in vertical orientation and center of the dial was used as the reference level.
- This result of calibration was made on requested at the point specified by customer.
- This instrument was used clean air as pressure media.
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certification is traceable to the International System of Unit maintained at:- National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Ausanee  
Issue Date: 22 July 2021

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

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Cert.No.: 21P2502  
Page: 2 of 2

Result of calibration: Without adjustment  
Function: Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa  
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	959.18	970.39	980.57	990.77	1000.79	1010.71	1020.54	1030.39
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	0.82	-0.39	-0.57	-0.77	-0.79	-0.71	-0.54	-0.39

Decreasing Pressure

Applied Pressure (hPa)	1030.46	1020.42	1010.54	1000.67	990.64	980.74	970.54	959.39
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-0.46	-0.42	-0.54	-0.67	-0.64	-0.74	-0.54	0.61

The uncertainty of measurement was  $\pm 0.30$  hPa

\* UUC = Unit Under Calibration

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

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

Certificate No.: 21H803  
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.129/2550

Condition As-Received: Used Item

Received Date: 29 March 2021

Calibration Date: 31 March 2021

Reference: 2103-1189WSC

Ambient Temperature: ( 25  $\pm$  3 ) °C

Relative Humidity: ( 50  $\pm$  20 ) %

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Corporate Services 3: Equipment Calibration and Testing Services.

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

81 Soi Udomsuk 41, Sukhumvit Road,  
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	A5A339	20168	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 Waeawanjan  
[ ] Ponthippa Tamayakul  
[ ] Pilak Srimongkol

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Cert. No.: 21H803  
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 ( $\pm$ %R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.8
25.0	80.0	79	-1.0	1.9

Result of Calibration: Without Adjustment  
Function: Temperature measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement ( $\pm$ °C)
20.011	20.0	-0.011	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 base on standard uncertainty multiplied by coverage factor  $k = 2.00$ , providing confidence level approximately 95%.

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a 1051239



United Analyst and Engineering Consultant Co., Ltd.

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Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

## MULTI-POINT GAS TEST REPORT

Test Date : Nov 9, 2021

Equipment: Gas Analyzer (SO<sub>2</sub>) Model: 43i  
Manufacturer: Thermo SCIENTIFIC Serial Number: 1180540065

### Standard Gas Concentration

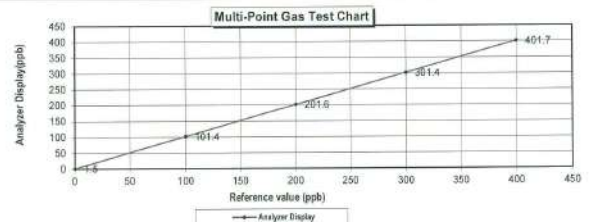
Gas	Concentration	Unit
Sulphur Dioxide (SO <sub>2</sub> )	44.75	PPM
Nitric Oxide (NO)	45.35	PPM
Methane (CH <sub>4</sub> )	-	PPM
Carbon Monoxide (CO)	1007	PPM
Cylinder No.:	CC159599	
Expiration Date:	Jul 30, 2022	

### Dilutor Detail

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

### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	1.5	1.50	1.50
Level 2 20.00%	100.0	1.01.4	1.40	1.38
Level 3 40.00%	200.0	201.6	1.60	0.79
Level 4 60.00%	300.0	301.4	1.40	0.46
Level 5 80.00%	400.0	401.7	1.70	0.42
Remark: Measuring Range	500.0 ppb		Average Difference (%)	0.91
	: Acceptable Limit $\pm 5\%$			



Calculate by  
Sirichon V.  
9/11/21

Approve by  
Sirichon V.  
9 Nov 2021

เอกสารไม่ควบคุม

### MULTI-POINT GAS TEST REPORT

Test Date : Nov 9, 2021

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540066

#### Standard Gas Concentration

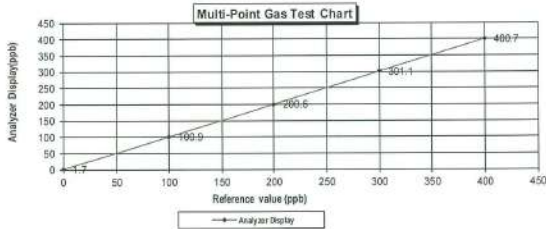
Sulphur Dioxide (SO<sub>2</sub>) 44.75 PPM  
Nitric Oxide (NO) 45.35 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 1007 PPM  
Cylinder No. : CC159599  
Expiration Date : Jul 30, 2022

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	1.7	1.70	1.70	1.70
Level 2 20.00% 100.0	100.9	0.90	0.89	0.89
Level 3 40.00% 200.0	200.6	0.60	0.30	0.30
Level 4 60.00% 300.0	301.1	1.10	0.37	0.37
Level 5 80.00% 400.0	400.7	0.70	0.17	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		0.69
Acceptable Limit $\pm 5\%$				



Calculate by  
Sirichai Y.  
9/11/21

Approve by  
Pobum W.  
9/11/21

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### MULTI-POINT GAS TEST REPORT

Test Date : Nov 9, 2021

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540067

#### Standard Gas Concentration

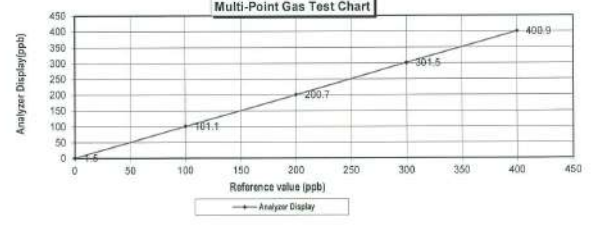
Sulphur Dioxide (SO<sub>2</sub>) 44.75 PPM  
Nitric Oxide (NO) 45.35 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 1007 PPM  
Cylinder No. : CC159599  
Expiration Date : Jul 30, 2022

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	1.5	1.50	1.50	1.50
Level 2 20.00% 100.0	101.1	1.10	1.09	1.09
Level 3 40.00% 200.0	200.7	0.70	0.35	0.35
Level 4 60.00% 300.0	301.5	1.50	0.50	0.50
Level 5 80.00% 400.0	400.9	0.90	0.22	0.22
Remark : Measuring Range 500.0 ppb		Average Difference (%)		0.73
Acceptable Limit $\pm 5\%$				



Calculate by  
Sirichai Y.  
9/11/21

Approve by  
Pobum W.  
9/11/21

Page 1 of 1

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### MULTI-POINT GAS TEST REPORT

Test Date : June 14, 2021

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo Scientific Serial Number : 1201778111

#### Standard Gas Concentration

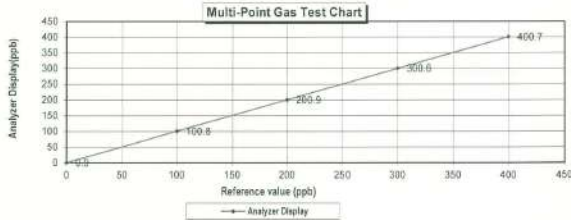
Sulphur Dioxide (SO<sub>2</sub>) 44.75 PPM  
Nitric Oxide (NO) 45.35 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 1007 PPM  
Cylinder No. : CC159599  
Expiration Date : Jul 30, 2022

#### Dilutor Detail

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

#### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	0.9	0.90	0.90	0.90
Level 2 20.00% 100.0	100.8	0.80	0.79	0.79
Level 3 40.00% 200.0	200.9	0.90	0.45	0.45
Level 4 60.00% 300.0	300.6	0.60	0.20	0.20
Level 5 80.00% 400.0	400.7	0.70	0.17	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		0.50
Acceptable Limit $\pm 5\%$				



Calculate by  
Sirichai Y.  
14/June/2021

Approve by  
Pobum W.  
14/June/2021

Page 1 of 1

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## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15A01QC Reference Number: 160-401526192-1  
Cylinder Number: CC159599 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12019 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO<sub>2</sub>,BALN Certification Date: Jul 30, 2019

Expiration Date: Jul 30, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 820R-12051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.76 PPM	G1	+/- 0.8% NIST Traceable	07/23/2019, 07/30/2019
NITRIC OXIDE	45.00 PPM	44.76 PPM	G1	+/- 0.8% NIST Traceable	07/23/2019, 07/30/2019
SULFUR DIOXIDE	45.00 PPM	45.35 PPM	G1	+/- 1% NIST Traceable	07/23/2019, 07/30/2019
CARBON MONOXIDE	1000 PPM	1007 PPM	G1	+/- 0.4% NIST Traceable	07/23/2019
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	18060121	KAL004215	249.9 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Nov 08, 2023
NTRM	052411	KAL004307	50.03 PPM NITRIC OXIDE/NITROGEN	+/- 0.80%	Mar 12, 2024
NTRM	18060121	KAL004215	250.0 PPM NOx/NITROGEN	+/- 0.4%	Nov 08, 2023
NTRM	052411	KAL004307-NOx	50.03 PPM NOx/NITROGEN	+/- 0.80%	Mar 12, 2024
NTRM	0141708	KAL003190	49.67 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Jun 20, 2022
NTRM	072508	KAL004573	870.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	May 14, 2021
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
CO MKS FTIR 000929062	FTIR		Jul 19, 2019		
NO MKS FTIR 000929062	FTIR		Jul 22, 2019		
NO MKS FTIR 000929062	FTIR		Jul 22, 2019		
SO2 MKS FTIR 000929062	FTIR		Jul 22, 2019		

Triad Data Available Upon Request

NOTES-RAN# 51319-CM03  
PO# 5219002210  
GROSS WEIGHT: 28.6 KG  
NET WEIGHT: 4.1 KG



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Page 1 of 160-401526192-1

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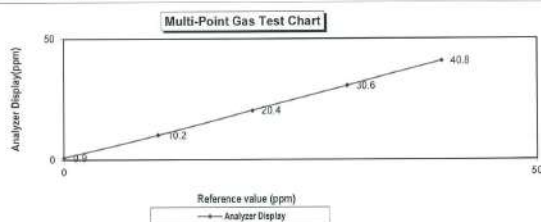
**MULTI-POINT GAS TEST REPORT**

Test Date : Nov 30, 2021

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

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH <sub>4</sub> )	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data						
Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.9	0.9	0.9	0.9
Level 2	20.00%	10.0	10.2	0.2	2.0	2.0
Level 3	40.00%	20.0	20.4	0.4	2.0	2.0
Level 4	60.00%	30.0	30.6	0.6	2.0	2.0
Level 5	80.00%	40.0	40.8	0.8	2.0	2.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		1.75



Calculate by  
 Sirichai Y.  
 30, 11, 2021

Approve by  
 Sirichai Y.  
 30, 11, 2021

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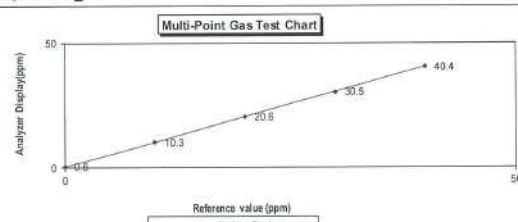
**MULTI-POINT GAS TEST REPORT**

Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48i  
 Manufacturer : Thermo Scientific Serial Number : 1201497730

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH <sub>4</sub> )	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data						
Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.6	0.6	0.6	0.6
Level 2	20.00%	10.0	10.3	0.3	2.9	2.9
Level 3	40.00%	20.0	20.6		2.9	2.9
Level 4	60.00%	30.0	30.5	0.5	1.6	1.6
Level 5	80.00%	40.0	40.4	0.4	1.0	1.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		1.81



Calculate by  
 Sirichai Y.  
 30, 11, 2021

Approve by  
 Sirichai Y.  
 30, 11, 2021

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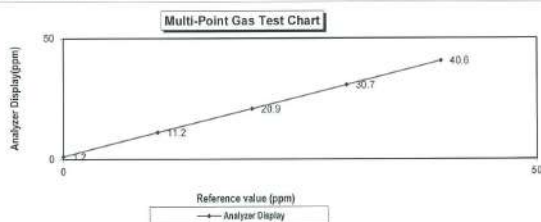
**MULTI-POINT GAS TEST REPORT**

Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48i  
 Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH <sub>4</sub> )	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data						
Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	1.2	1.2	1.2	1.2
Level 2	20.00%	10.0	11.2	1.2	10.7	10.7
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.6	0.6	1.5	1.5
Remark : Measuring Range		50.0 ppm	Average Difference (%) 4.00			



Calculate by  
 Sirichai Y.  
 30, 11, 2021

Approve by  
 Sirichai Y.  
 30, 11, 2021

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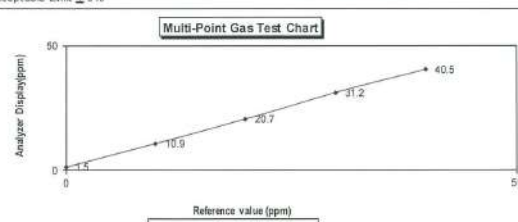
**MULTI-POINT GAS TEST REPORT**

Test Date : Nov 30, 2021

Equipment : Gas Analyzer (CO) Model : 48i  
 Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH <sub>4</sub> )	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data						
Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.5	1.5	1.5	1.5
Level 2	20.00%	10.0	10.9	0.9	8.3	8.3
Level 3	40.00%	20.0	20.7	0.7	3.4	3.4
Level 4	60.00%	30.0	31.2	1.2	3.8	3.8
Level 5	80.00%	40.0	40.5	0.5	1.2	1.2
Remark : Measuring Range			50.0 ppm	Average Difference (%)		3.64
						:Acceptable Limit $\pm 5\%$



Calculate by  
 Sirichai Y.  
 30, 11, 2021

Approve by  
 Sirichai Y.  
 30, 11, 2021

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CERTIFICATE OF ANALYSIS  
Grade of Product: EPA Protocol

Part Number: E04N199E15A01QC Reference Number: 160-401526192-1  
Cylinder Number: CC159599 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12019 Valve Outlet: 660  
Gas Code: CO, NO, NOX, SO2, BALN Certification Date: Jul 30, 2019  
Expiration Date: Jul 30, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12051, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	44.76 PPM	G1	+/- 0.8% NIST Traceable
NITRIC OXIDE	45.00 PPM	44.76 PPM	G1	+/- 0.8% NIST Traceable
SULFUR DIOXIDE	45.00 PPM	45.35 PPM	G1	+/- 1% NIST Traceable
CARBON MONOXIDE	1000 PPM	1007 PPM	G1	+/- 0.4% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	18060121	KAL004215	249.9 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%
NTRM	052411	KAL004307	50.03 PPM NITRIC OXIDE/NITROGEN	+/- 0.80%
NTRM	18060121	KAL004215	250.0 PPM NOX/NITROGEN	+/- 0.4%
NTRM	052411	KAL004307-NOX	50.03 PPM NOX/NITROGEN	+/- 0.80%
NTRM	0141709	KAL003190	49.67 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%
NTRM	072508	KAL004573	970.5 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO MKS FTIR 000929062	FTIR	Jul 19, 2019
NO MKS FTIR 000929062	FTIR	Jul 22, 2019
NO MKS FTIR 000929062	FTIR	Jul 22, 2019
SO2 MKS FTIR 000929062	FTIR	Jul 22, 2019

Triad Data Available Upon Request

NOTES: RAN# 51319-CM03  
PCW 5219002210  
GROSS WEIGHT: 28.6 KG  
NET WEIGHT: 4.1 KG



Signature on file  
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Page 1 of 160-401526192-1

เอกสารไม่ควบคุม

## Certificate of Calibration

## WL-21 Wireless Anemometer

Scarlet Tech Ltd, hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0058

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

## The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	1.9	0.1	1.8 - 2.2	Pass
5.0	5.0	0.0	4.7 - 5.3	Pass
7.0	7.2	0.2	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	20.0	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	47	2	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.5	0.3	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions:

Air temperature: 22 °C  
Relative humidity: 62 %  
Static pressure: 102.2 kPa

Performed by:

Jim Lim

Certified by  
Head of Engineering department

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## Certificate of Calibration

## WL-21 Wireless Anemometer

Scarlet Tech Ltd, hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0065

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

## The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.1	0.1	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	19.8	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	43	2	42 - 48	Pass
135°	136	1	132 - 138	Pass
225°	225	0	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	2	2	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2	0.0	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	997	1	994-1002	Pass

Environment conditions:

Air temperature: 22 °C  
Relative humidity: 62 %  
Static pressure: 102.2 kPa

Performed by:

Jim Lim

Certified by  
Head of Engineering department

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## Certificate of Calibration

## WL-21 Wireless Anemometer

Scarlet Tech Ltd, hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0072

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

## The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.1	0.1	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.0	0.0	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.2	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2	0.0	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions:

Air temperature: 22 °C  
Relative humidity: 62 %  
Static pressure: 102.2 kPa

Performed by:

Jim Lim

Certified by  
Head of Engineering department

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# Certificate of Calibration

## WL-21 Wireless Anemometer

Scarlet Tech Ltd, hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2112DT0102

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

### The Result of Calibration

Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.9	0.1	4.7 - 5.3	Pass
7.0	7.3	0.3	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.1	0.1	19.0 - 21.0	Pass

Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	134	1	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	0	0	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.8	0.6	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions:

Air temperature: 22 °C

Relative humidity: 62 %

Static pressure: 102.2 kPa

Performed by:

*Jim Lin*

Certified by  
Head of Engineering department

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4F-3, No. 347, 2nd Sec., Heping E. Rd., Daan Dist., Taipei City 106, Taiwan

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### Certificate of Calibration

#### Customer

Name : UNITED ANALYST AND ENGINEERING  
CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,  
Bangkok 10260

Certificate No : 21-ACT-188  
Request No : Req-2021-0523

#### Unit Under Calibration Details

Measurement item : Acoustic Calibrator  
Manufacturer : SVANTEK  
Model : SV 35  
Serial Number : 44792  
ID : UAE.EFM.020/2559  
Class : 1  
Range : 94 - 134 dB / 1000 Hz  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : ( 23 ± 2 °C )  
Humidity : ( 50 ± 20 %RH )  
Barometric Pressure : (1013 ±10.0 kPa )  
Received Date : 27 April 2021  
Calibration Date : 28 May 2021  
Location of Calibration : LAB 1 Acoustic  
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	14 May 2022
THD Multimeter	2015	1047765	NIMT	22 January 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 %.

Calibrated By :

*me*  
Mr. Noppadon Luangart  
Service Calibration Engineer

Approved By :

*Mr. Pait Mathavorn*  
Mr. Pait Mathavorn  
Calibration Engineer Supervisor

Issue Date : 28 May 2021

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing organization.  
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Certificate No : 21-ACT-188

Request No : Req-2021-0523

### Calibration Results: Without Adjustment

#### Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	93.98	-0.02	-	-	0.11	0.25
114 dB / 1000 Hz	114.03	0.03	-	-	0.11	0.25

#### Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.02	0.70
114 dB / 1000 Hz	1000.00	0.00	-	-	0.02	0.70

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Error (%)	Measured (%)	Error (%)		
94 dB / 1000 Hz	0.04	-	-	-	0.17	2.5
114 dB / 1000 Hz	0.02	-	-	-	0.17	2.5

#### Note :

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing organization.  
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### Certificate of Calibration

#### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok,  
10260

Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LxT2  
Serial Number : 0005394  
ID : UAE.EFM.031/2564  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 329361  
Preamplifier Model : PRMLX72C  
Preamplifier S/N : 073810  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 14 January 2022  
Calibrated Date : 21 January 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

#### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EF A000234	14 June 2022	TSE
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

#### Note

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

Calibrated By :

*me*  
Mr. Noppadon Luangart  
Calibration Officer

Approved By :

*Mr. Pait Mathavorn*  
Mr. Pait Mathavorn  
Calibration Engineer Supervisor

Issue Date : 21 January 2022

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

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

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	0.20	0.3

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

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
A	27.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
A	27.5	0.10
C	27.0	0.10
Z	31.8	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.0	0.1	0.0	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.2	0.3	0.2	0.60	3.0
8000 Hz	-0.3	-0.3	-0.3	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.  
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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
63 Hz	-0.2	-0.1	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -INF

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / 37-139	REF	UUC	ERR	(± dB)	Limit
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
37-139 / A	REF	UUC	ERR	(± dB)	Limit
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.  
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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 7. Long Term Stability

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

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	(± dB)	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.3	0.3		1.1
37.00	37	37.5	0.5		1.1

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Certificate No : 22-ACT-034  
Request No : Req-2022-0092

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	42.8	43.0	0.2	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	135.0	0.0	0.3	1
	2	118.0	117.7	-0.3		+1.0, -2.5
	0.25	109.0	108.8	-0.2		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	109.0	109.1	+0.1		+1.0, -2.5
SEL	200	129.0	129.0	0.0		1
	2	109.0	109.1	+0.1		+1.0, -2.5
	0.25	100.0	100.0	0.0		+1.5, -5.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.1	-0.30		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.  
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## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok  
10260

Certificate No : 22-ACT-105

Request No : Req-2022-0229

### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Class : 2  
Manufacturer : LARSON DAVIS  
Microphone Model : 375A04  
Model : LxT2  
Microphone S/N : 329350  
Serial Number : 0005396  
Preamplifier Model : PRMLxT2C  
ID : UAEEFM.033/2564  
Preamplifier S/N : 073812  
Resolution : 0.1 dB  
Instrument Status : Used

### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic


### Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000224	14 June 2022	TSI
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

### Note

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

Calibrated By :   
Mr. Noppadol Luangart  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 11 February 2022

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.

FS-709-SLM-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-105

Request No : Req-2022-0229

### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	0.20	0.3

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

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.8	0.10
C	27.3	0.10
Z	33.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.1	0.2	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.6	0.5	0.6	0.60	3.0
8000 Hz	0.1	0.0	0.2	0.70	5.0

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5.0
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

### 6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
37-139 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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.

FS-709-SLM-01 Rev.0 Issue date 01/07/21

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FS-709-SLM-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-105  
Request No : Req-2022-0229

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	68.9	-0.1	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	58.9	-0.1	1.1
54.00	54	53.9	-0.1	1.1
49.00	49	48.9	-0.1	1.1
44.00	44	44.0	0.0	1.1
39.00	39	39.2	0.2	1.1
34.00	34	34.3	0.3	1.1

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-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	43.2	42.8	-0.4	1.1
	114	114.0	0.0	1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	134.9	-0.1	1.0
	2	118.0	117.6	-0.4	+1.0, -2.5
	0.25	109.0	108.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1.0
	2	109.0	108.9	-0.1	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1.0
	2	109.0	108.9	-0.1	+1.0, -2.5
	0.25	100.0	100.0	0.0	+1.5, -5.0

#### 11. Peak C Sound level

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

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-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105  
Request No : Req-2022-0229

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.7		
Negative one-half cycle	141.8		
Deviated	-0.1	0.2	1.5

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

#### Certificate of Calibration

Customer  
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bungehak, Prakanong, Bangkok 10260  
Certificate No : 22-ACT-035  
Request No : Req-2022-0094

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LxT2  
Serial Number : 0085398  
ID : UAEFFM.035/2564  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 328675  
Preamplifier Model : PRMLxT2C  
Preamplifier S/N : 073793  
Instrument Status : Used

#### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 14 January 2022  
Calibrated Date : 21 January 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic


#### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cai	EF-A000234	14 June 2022	TSI
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

#### Note

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

Calibrated By :   
Mr. Noppakorn Luangrat  
Calibration Officer

Approved By :   
Mr. Pachi Mahayorn  
Calibration Engineer Supervisor  
Issue Date : 21 January 2022

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-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

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-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม



Certificate No : 22-ACT-035  
Request No : Req-2022-0094

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

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139 Calibrator Setting							
1000 Hz / 114.00 dB	113.83	114.0	+0.15	113.9	0.05	0.20	0.3

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

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting (dB)		( $\pm$ dB)
A	28.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting (dB)		( $\pm$ dB)
A	27.9	0.10
C	27.3	0.10
Z	31.9	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve				UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z			
FAST / 37-139						
STD Setting (dB)	(dB)	(dB)	(dB)			
125 Hz	0.0	0.0	0.0	0.50	2.0	
1000 Hz	0.0	0.0	0.0	0.60	1.0	
4000 Hz	0.4	0.3	0.3	0.60	3.0	
8000 Hz	-0.1	-0.2	-0.1	0.70	3.0	

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-035  
Request No : Req-2022-0094

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	0.0	-0.1		1.5
500 Hz	-0.1	0.0	-0.1		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF (dB)	ERR (dB)		
FAST / 37-139					
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF (dB)	ERR (dB)		
37-139 / A					
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-035  
Request No : Req-2022-0094

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC (dB)		
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0		

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF (dB)	ERR (dB)		
FAST / A / 37-139					
STD dB					
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.3	0.3		1.1
30.00	30	30.3	0.3		1.1

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-035  
Request No : Req-2022-0094

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF (dB)	ERR (dB)		
FAST / A					
UUC Range					
37-139	43.2	43.4	0.2	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
			REF (ms)	ERR (dB)		
A / 37-139						
UUC Time Response						
Fast	200	135.0	135.0	0.0	0.3	1
	2	118.0	117.9	-0.1		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	109.0	109.1	+0.1		1
SEL	200	129.0	129.0	0.0		+1.0, -2.5
	2	109.0	109.1	+0.1		+1.5, -5.0
	0.25	100.0	99.9	-0.1		

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		REF (dB)	ERR (dB)		
FAST / C / 95-142					
STD Setting					
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.1	-0.30		2.0
Negative half cycle	136.4	136.1	-0.30		2.0

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-035  
Request No : Req-2022-0094

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	142.3		
Negative one-half cycle	142.0		
Deviated	0.3		

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviated	0.0		

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body. (ฉบับนี้เกี่ยวข้องกับผลการสอบเทียบเท่านั้น ไม่สามารถนำผลไปใช้ซ้ำโดยไม่ได้รับอนุญาตจากห้องปฏิบัติการสอบเทียบ)

เอกสารไม่ควบคุม

#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 22-ACT-036

Request No : Req-2022-0095

##### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : LARSON DAVIS  
Model : LxT2  
Serial Number : 0065400  
ID : UAEEFM0372564  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 328676  
Preamplifier Model : PRMLxT2C  
Preamplifier S/N : 073803  
Instrument Status : Used

##### Calibration Environment and Details

Temperature : 23 °C  $\pm$  2 °C  
Humidity : 50 %RH  $\pm$  20 %RH  
Barometric Pressure : 1013 hPa  $\pm$  10 hPa  
Received Date : 14 January 2022  
Calibrated Date : 21 January 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

##### Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFM000234	14 June 2022	TSI
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

##### Note

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

Calibrated By :  
Mr. Nopphon Luangrat  
Calibration Officer

Approved By :  
Mr. Pacht Mahavoon  
Calibration Engineer Supervisor  
Issue Date : 21 January 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body. (ฉบับนี้เกี่ยวข้องกับผลการสอบเทียบเท่านั้น ไม่สามารถนำผลไปใช้ซ้ำโดยไม่ได้รับอนุญาตจากห้องปฏิบัติการสอบเทียบ)

เอกสารไม่ควบคุม

Certificate No : 22-ACT-036  
Request No : Req-2022-0095

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

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 37-139	Level (dB)	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
Calibrator Setting							
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	0.20	0.3

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

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting		
A	29.6	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	( $\pm$ dB)
UUC Weighting		
A	28.8	0.10
C	28.2	0.10
Z	32.9	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
STD Setting					
125 Hz	-0.1	0.1	0.0	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.8
4000 Hz	0.5	0.5	0.6	0.60	3.0
8000 Hz	0.4	0.4	0.5	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body. (ฉบับนี้เกี่ยวข้องกับผลการสอบเทียบเท่านั้น ไม่สามารถนำผลไปใช้ซ้ำโดยไม่ได้รับอนุญาตจากห้องปฏิบัติการสอบเทียบ)

เอกสารไม่ควบคุม

Certificate No : 22-ACT-036  
Request No : Req-2022-0095

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / 37-139	A (dB)	C (dB)	Z (dB)		
STD Setting					
63 Hz	-0.2	-0.1	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	0.0	0.0		5
16000 Hz	-0.1	-0.1	0.0		+5, -INF.

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / 37-139	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
37-139 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body. (ฉบับนี้เกี่ยวข้องกับผลการสอบเทียบเท่านั้น ไม่สามารถนำผลไปใช้ซ้ำโดยไม่ได้รับอนุญาตจากห้องปฏิบัติการสอบเทียบ)

เอกสารไม่ควบคุม



Certificate No : 22-ACT-036  
Request No : Req-2022-0095

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.2

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	69.0	0.0	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	1.1
39.00	39	39.3	0.3	1.1
34.00	34	34.5	0.5	1.1
37.00	37	37.5	0.5	1.1

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

Certificate No : 22-ACT-036  
Request No : Req-2022-0095

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	42.9	43.2	0.3	1.1
	114	114.0	0.0	1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	1
	2	118.0	117.8	-0.2	+1.0, -2.5
	0.25	109.0	108.8	-0.2	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	108.8	-0.2	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1
	2	109.0	109.0	0.0	+1.0, -2.5
	0.25	100.0	99.9	-0.1	+1.5, -5.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.9	-0.50	3.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

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

Certificate No : 22-ACT-036  
Request No : Req-2022-0095

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	142.1		
Negative one-half cycle	141.9		
Deviated	0.2	0.2	1.5

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

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

#### Certificate of Calibration

##### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 22-ACT-103  
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2022-0230  
10260

##### Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2  
Manufacturer : LARSON DAVIS Microphone Model : 375A04  
Model : LxT2 Microphone S/N : 328668  
Serial Number : 0005402 Preamplifier Model : PRMLxT2C  
ID : UAE.EFM.038/2564 Preamplifier S/N : 071540  
Resolution : 0.1 dB Instrument Status : Used

##### Calibration Environment and Details


Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic


##### Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	138273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	SvanteK	Svan401	131	18 October 2022	WK Electric

##### Note

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

Calibrated By :   
Mr. Noppadon Luangrat  
Calibration Officer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 11 February 2022

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

Certificate No : 22-ACT-103  
Request No : Req-2022-0230

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

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	Level (dB)	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139							
Calibrator Setting	(dB)						
1000 Hz 114.00 dB	113.85	114.9	+0.15	113.9	0.05	0.20	0.3

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

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	( $\pm$ dB)
A	28.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	( $\pm$ dB)
A	28.1	0.10
C	27.9	0.10
Z	34.4	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A	C	Z		
FAST / 37-139					
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.9	0.9	1.0	0.60	3.0
8000 Hz	0.7	0.7	0.8	0.70	5.0

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FM-708-SLM-01 Rev.0 Issue date 01/07/11

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103  
Request No : Req-2022-0230

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	REF (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139					
STD dB					
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.0	0.0		1.1
39.00	39	39.3	0.3		1.1
34.00	38	38.3	0.3		1.1

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FM-708-SLM-01 Rev.0 Issue date 01/07/11

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Certificate No : 22-ACT-103  
Request No : Req-2022-0230

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5.0
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	REF (dB)	UUC (dB)	ERR (dB)		
FAST / 37-139					
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	REF (dB)	UUC (dB)	ERR (dB)		
37-139 / A					
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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FM-708-SLM-01 Rev.0 Issue date 01/07/11

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Certificate No : 22-ACT-103  
Request No : Req-2022-0230

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	REF (dB)	UUC (dB)	ERR (dB)		
FAST / A					
UUC Range					
37-139	43.2	42.9	-0.3	0.3	1.1
	114	114.0	0.0		1.1

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	Toneburst (ms)	Ref (dB)	UUC (dB)	ERR (dB)		
A / 37-139						
UUC Time Response						
Fast	200	135.0	135.0	0.0	0.3	1.0
	2	118.0	117.7	-0.3		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
SEL	200	129.0	129.0	0.0		1.0
	2	109.0	109.0	0.0		+1.0, -2.5
	0.25	100.0	99.9	-0.1		+1.5, -5.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
	REF (dB)	UUC (dB)	ERR (dB)		
FAST / C / 95-142					
STD Setting					
Complete cycle	137.4	136.7	-0.70	0.2	3.0
Positive half cycle	136.4	136.1	-0.30		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

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Certificate No : 22-ACT-103  
 Request No : Req-2022-0230

## 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC:		Limit
STD Setting	(dB)	( ± dB)	( ± dB)
Positive one-half cycle	142.2		
Negative one-half cycle	142.3		
Deviated	-0.1	0.2	1.5

## 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC:		Limit
STD Setting	(dB)	( ± dB)	( ± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

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

FS-70B-SLA-91 Rev.0 Issue date 01/07/11

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
 53444 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
 TEL. 0-2717-3000-37 FAX. 0-2719-9484



Cert.No.: 21CH788  
 Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
 Manufacturer : Horiba  
 Model : LAQUA-PH210  
 Serial No. : HA0C0025  
 ID No. : UAE.EFM.117/2563(ENV.pH.07/63)  
 Condition As-Received: Used item  
 Received Date : 14 June 2021  
 Calibration Date : 16 June 2021  
 Reference : 2108-0456WSC-3  
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangkok, 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 Lernagatrakul

Approved by :   
 Approved Signatory

( / ) Malee Butkruea  
 ( ) Saitthip Meangmai  
 ( ) Warakorn Lernagatrakul

Issue Date : 21 June 2021

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0026445



Cert.No.: 21CH788  
 Page.: 2 of 3

## Condition of this calibration result

- Reference Standard Instrument : -  

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43180066	130RC092	21E1223/1	27 Apr 2022
2) Ref. Standard Thermometer	2188080	130RC044	2011389	19 Nov 2021

This certification is traceable to the International System of Unit maintained at:-  
 - Traceable to National Institute of Metrology (Thailand), NIMT

- 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	725926	13 Jan 2023
pH 6.985	CPA chem	725927	12 Jan 2022
pH 10.012	CPA chem	725928	12 Jan 2022

- 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	Coverage factor
	pH	mV	mV	pH	( ±mV )	k
pH Meter S/N.: HA0C0025	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	7.00	0.00	0.0	7.02	0.058	2.00
	10.00	-177.48	-177.5	10.01	0.058	2.00

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A 1059420



Cert.No.: 21CH788  
Page.: 3 of 3

#### Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( $\pm$ )	Coverage factor k
pH Electrode S/N.: 990C0199	4.008	4.01	152.7	0.0079	2.00
	6.985	6.99	-21.3	0.0093	2.00
	6.985	6.99	-21.7	0.0093	2.00
	10.012	10.01	-195.4	0.013	2.00

Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652

- Serial No. : 990C0199

Dimension of probe;

- Length : 90 mm.

- Diameter : 15 mm.

- Immersion Depth : 80 mm.

Calibration Point ( $^{\circ}\text{C}$ )	Standard Temperature ( $^{\circ}\text{C}$ )	UUC* Reading ( $^{\circ}\text{C}$ )	Error ( $^{\circ}\text{C}$ )	Uncertainty of measurement ( $\pm$ $^{\circ}\text{C}$ )	Coverage factor k
25.0	25.003	25.0	-0.003	0.20	2.00
30.0	30.001	30.0	-0.001	0.20	2.00
35.0	35.005	35.0	-0.005	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 %.

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Malee

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A 1059419



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

Cert.No.: 21TW127  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : Horiba  
Model : LAQUA-DO210  
Serial No. : HE9M0048  
ID No. : UAE.EFM.118/2563 (ENV.DO.07/63)  
Received Date : 14 June 2021  
Test Date : 17 June 2021  
Reference : 2106-0456WSC-1  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
Laboratory Condition : Temperature (  $25 \pm 5$  )  $^{\circ}\text{C}$   
Humidity (  $50 \pm 20$  ) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method  
Tested by : Walalak Sirithean  
Approved by :   
Approved Signatory  
( / ) Malee Butkruea  
( ) Salthip Meangmai  
( ) Warakorn Lemgagtrakul  
Issue Date : 21 June 2021

Malee

Approved Signatory

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B 0263403



Cert.No.: 21TW127  
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 9K9M0021

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
7.98	7.99	0.00

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Malee

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A 1059418



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Cert. No.: 21TM963  
Page.: 1 of 2

## Certificate of Calibration

Equipment : DO Meter with Sensor  
Manufacturer : Horiba  
Model : LAQUA-DO210  
Serial No. : HE9M0048  
ID No. : UAE.EFM.118/2563 (ENV.DO.07/63)  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
Location : TPA On Site Calibration Laboratory  
Received Order : 14 June 2021  
Calibrated Date : 21 June 2021  
Ambient Temperature : (  $28 \pm 10$  )  $^{\circ}\text{C}$   
Relative Humidity : (  $50 \pm 30$  ) %  
AC Line Voltage : (  $220 \pm 22$  ) V  
Calibrated by : Malee Butkruea  
Approved by :   
Approved Signatory  
( ) Ponthippa Tameyakul  
( / ) Suwit Imjai  
Issue Date : 22 June 2021

The Uncertainties are for a confidence probability of approximately 95%

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A 004212





Equipment: DO Meter with Sensor  
 Condition As-Received: Used Item  
 Reference: 2106-0456WSC-2  
 Cert. No.: 21TM863  
 Page: 2 of 2

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

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188080	2011389	20 Nov 2021

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 : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 9K9M0021

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (±°C)	Coverage Factor k
25.0	60	24.995	24.9	-0.095	0.16	2.00
30.0	60	30.006	29.9	-0.106	0.16	2.00
35.0	60	35.004	34.9	-0.104	0.16	2.00

UUC\* : Unit Under Calibration

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

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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 8558 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Certificate

Certificate No.: 2200704-001-01  
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
 Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: Electronic Balance  
 Manufacturer: Mettler Toledo  
 Model: AB204-S  
 Serial No.: 1128312528  
 ID No.: UAE.AIR.019/2550  
 Order No.: 2200704  
 Operation No.: 2200704-001  
 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 8558 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Report

Certificate No.: 2200704-001-01  
 Equipment: Electronic Balance  
 Model: AB204-S  
 Serial No.: 1128312528  
 Capacity: 200 g  
 Manufacturer: Mettler Toledo  
 Resolution: 0.0001 g  
 ID No.: UAE.AIR.019/2550

Date of Calibration: 24 November 2021 Page 2 of 5

Environment Condition: Ambient Temperature: 21.5 ± 0.5 °C Relative Humidity: 43 ± 2.5 %

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

Condition of Equipment: Good Condition

#### Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	8308068554	TCS	M21018975	12 January 2022
Standard Weight Class E2	1-500g	8308068128	TCS	M21018985	13 January 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	azw.ahl. BTH 003/55	Quality Reborn	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:

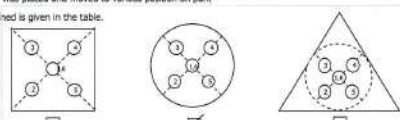
##### 1. Repeatability of Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
10	0.00000
20	0.00000

##### 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)
49.9999	49.9999	49.9999	49.9999	49.9999	49.9999	0.0000

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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.  
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## Calibration Report

Certificate No.: 2200704-001-01  
 Equipment: Electronic Balance  
 Model: AB204-S  
 Serial No.: 1128312528  
 Capacity: 200 g  
 Manufacturer: Mettler Toledo  
 Resolution: 0.0001 g  
 ID No.: UAE.AIR.019/2550

Date of Calibration: 24 November 2021 Page 3 of 5

Calibration Results: (Continued)

Calibration Range: 0-20 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Test Weight by filter pan)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(±g)	k
Unloaded	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	0.50000	0.5000	0.0000	0.000083	2.00
1	1.00001	1.0000	0.0000	0.000083	2.00
2	2.00001	2.0000	0.0000	0.000083	2.00
3	3.00001	3.0000	0.0000	0.000084	2.00
4	4.00001	4.0000	0.0000	0.000085	2.00
5	5.00000	4.9999	0.0001	0.000084	2.00
10	9.99998	9.9999	0.0001	0.000087	2.00
15	14.99998	14.9999	0.0001	0.000089	2.00
20	19.99999	19.9999	0.0001	0.000089	2.00

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

## Calibration Report

**Certificate No.:** 2200704-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** Mettler Toledo  
**Model:** AB204-S  
**Resolution:** 0.0001 g  
**Serial No.:** 1128312528  
**ID No.:** UAE.AIR.019/2550  
**Capacity:** 200 g

**Date of Calibration:** 24 November 2021 Page 4 of 5

**Environment Condition:** Ambient Temperature: 21.5 ± 0.5 °C Relative Humidity: 43 ± 2.5 %

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

**Condition of Equipment:** Good Condition

**Condition of This Results of Calibration:**

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	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	11A1	899.01.003/55	Quality Reborn	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)
100	0.00000
200	0.00000

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)
49.9999	49.9999	49.9999	49.9999	49.9999	49.9999	0.0000

เอกสารไม่ควบคุม

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

## Calibration Report

**Certificate No.:** 2200704-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** Mettler Toledo  
**Model:** AB204-S  
**Resolution:** 0.0001 g  
**Serial No.:** 1128312528  
**ID No.:** UAE.AIR.019/2550  
**Capacity:** 200 g

**Date of Calibration:** 24 November 2021 Page 5 of 5

**Calibration Results:** (Continued)

**Calibration Range:** 0-200 g

**Calibration Adjustment:** Internal Calibration

3. Departure from Nominal Value:

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	
Unlad	0.00000	0.0000	0.0000	0.000082	2.00
0.1	0.10000	0.1000	0.0000	0.000082	2.00
0.5	0.50000	0.5000	0.0000	0.000083	2.00
1	1.00001	1.0000	0.0000	0.000083	2.00
5	5.00000	4.9999	0.0001	0.000084	2.00
10	9.99998	9.9999	0.0001	0.000087	2.00
20	19.99999	19.9999	0.0001	0.000089	2.00
50	49.99990	49.9999	0.0000	0.00012	2.00
70	69.99989	69.9999	0.0000	0.00014	2.00
100	100.00000	99.9999	0.0001	0.00017	2.00
120	119.99999	119.9999	0.0001	0.00019	2.00
150	149.99990	149.9999	0.0000	0.00022	2.00
200	200.00009	199.9999	0.0002	0.00029	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.:** 2102572-001-01  
**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

**Date of Issue:** 29 April 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 is valid only when used 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.:** 2102572-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** AB204-S/FACT  
**Resolution:** 0.0001 g  
**Serial No.:** B108115858  
**ID No.:** UAE.AIR.016/2555  
**Capacity:** 220 g

**Date of Calibration:** 26 April 2021 Page 2 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:

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	POUMPE 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 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



## Calibration Report

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

**Date of Calibration:** 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 (±g)	Coverage Factor k
Uncal	0.0000	0.0000	0.0000	0.000082	2.00
0.1	0.10000	0.10000	0.0000	0.000082	2.00
0.5	0.49999	0.50000	0.0000	0.000083	2.00
1	0.99999	1.00000	0.0000	0.000086	2.00
2	1.99999	2.00000	0.0000	0.000084	2.00
5	4.99998	5.00000	0.0000	0.000084	2.00
10	10.00003	10.00000	0.0000	0.00011	2.00
15	15.00001	15.00000	0.0000	0.00012	2.00
20	20.00004	20.00000	0.0000	0.00013	2.00
30	30.00006	30.00001	0.0000	0.00015	2.00
40	40.00008	40.00001	-0.0001	0.00014	2.00
50	49.99999	50.00002	-0.0002	0.00015	2.00
70	70.00003	70.00002	-0.0002	0.00019	2.00
100	99.99997	100.00003	-0.0003	0.00020	2.00
150	149.99997	150.00004	-0.0004	0.00027	2.00
200	199.99999	200.00005	-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:** Electronic Balance  
**Model:** AB204-S/FACT  
**Serial No.:** B108115858  
**Capacity:** 220 g  
**Manufacturer:** METTLER TOLEDO  
**Resolution:** 0.0001 g  
**ID No.:** UAE.AIR.016/2555

**Date of Calibration:** 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:

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	PONTE 490	NFL87H 004/18	Quality Room	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)

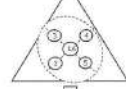
1. Repeatability of Reading:

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

**Date of Calibration:** 26 April 2021 **Page 5 of 5**

**Calibration Results:** (Continued)  
**Calibration Range:** 0 - 200 g  
**Calibration Adjustment:** Internal 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 k
Uncal	0.00000	0.00000	0.0000	0.000082	2.00
0.01	0.01000	0.01000	0.0000	0.000082	2.00
0.05	0.05000	0.05000	0.0000	0.000082	2.00
0.1	0.10000	0.10000	0.0000	0.000082	2.00
0.5	0.49999	0.50000	0.0000	0.000083	2.00
1	0.99999	1.00000	0.0000	0.000086	2.00
2	1.99999	2.00000	0.0000	0.000084	2.00
3	2.99998	3.00000	0.0000	0.000087	2.00
4	3.99999	4.00000	0.0000	0.000085	2.00
5	4.99998	5.00000	0.0000	0.000084	2.00
10	10.00003	10.00000	0.0000	0.00011	2.00
15	15.00001	15.00000	0.0000	0.00012	2.00
20	20.00004	20.00000	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 %.

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

เอกสารไม่ควบคุม

## 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 Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

**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  
**Date of Issue:** 2 July 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 related as 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-012 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-CG-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 53069-01	30 October 2021
2.3 Thermo-Hygro Meter	NFI.BTH003/17	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	PH-216.L5	2 October 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	710049	CPAchem	PH-217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710050	CPAchem	PH-220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107.L5	2 October 2021

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

3.1 Instruments No.2.1 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0075

3.2 Instruments No.2.2 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0061

3.3 Instruments No.2.3 through NSC-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0292

3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method: Hamed cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

3.5 Certified Reference Material No. 2.7 traceable to BM Ref H-7 Lot# 30.04.2020, BM Ref H-9 Lot# 28.05.2020, BM Ref H-8 Lot# 30.04.2020, BM Ref H-10 Lot# 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.

F-CS-012 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 3 of 5

Calibration Results: ( Manual Temperature Compensation at 25 °C )

1. Calibration of pH Meter

Nominal pH	DC Voltage Standard ( mV )	Average Indicator Reading		Uncertainty ( mV )	Coverage Factor ( # )
		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	0.990	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 Type: Combined Electrode  
Manufacturer: HANNA INSTRUMENTS Model: HI11310  
Serial No.: 078743 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 ( # )
	pH	mV			
4.008	4.01	162.7	99.1	0.0071	2.00
6.866	6.87	-4.9	99.0	0.0075	2.00
6.866	6.87	-4.9	99.0	0.0075	2.00
10.008	10.01	-161.3	-	0.0093	2.00
6.985	7.00	-13.6	-	0.0093	2.00

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 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	A65997	TE 640028-01	12-Dec-21	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

Support Equipment : - Low Temperature Bath (SDCAL-6), Model: Europa-8 Plus Basic, S/N: 341592/2

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

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

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

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

F-CS-012 Revision: 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 %.

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

เอกสารไม่ควบคุม

## Calibration Certificate

Certificate No.: 2202093-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO  
Model: SevenEasy pH  
Serial No.: 1230525212  
ID No.: UAE.WAS.003/2553  
Order No.: 2202093  
Operation No.: 2202093-001  
Date of Receipt: 11 March 2022  
Date of Calibration: 16 March 2022

Calibrated by Mr. Manas Somsak Specialist  
Approved by  (Mr. Pheraphat Tuanjit)  
Manager, Division of Calibration Laboratory  
Date of Issue: 21 March 2022 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.: 2202093-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO Model: SevenEasy pH  
Serial No.: 1230525212 Type: Bench top  
ID No.: UAE.WAS.003/2553

Date of Calibration: 16 March 2022 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute.  
Environment Condition: Ambient Temperature: ( 23.0 ± 1.5 ) °C Relative Humidity: ( 49.5 ± 5 ) %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

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

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fuke	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fuke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	202.411.BTH.90558	POMPE	QR21-2787	15 November 2022

Certified Reference Material	Lot No.	Manufacturer	Ref N	Expiry Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	780012	CPAchem	PH216.L5	21 November 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	780013	CPAchem	PH217.L5	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	780015	CPAchem	PH220.L5	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	776840	CPAchem	PH107.L5	8 November 2022

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.0076  
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- Hamed cell using calibrated thermometer, salinometer, and nanovoltmeter. 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 BIM RefN Hi-7 LoN 30.04.2020; BIM RefN Hi-8 LoN 28.05.2020; BIM RefN Hi-8 LoN 30.04.2020; BIM RefN 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.

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

เอกสารไม่ควบคุม

## Calibration Report

Certificate No.: 2202093-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: METTLER TOLEDO Model: SevenEasy pH  
Serial No.: 1230525212 Type: Bench top  
ID No.: UAE.WAS.003/2553

Date of Calibration: 16 March 2022 Page 3 of 5

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

Nominal pH	DC Voltage Standard ( mV )	Average Indicator Reading		Uncertainty ( ±mV )	Coverage Factor ( k )
		mV	pH		
0	-414.117	414	0.00	0.58	2.00
2	295.611	296	2.00	0.58	2.00
4	177.482	178	4.00	0.58	2.00
6	59.159	59	6.00	0.58	2.00
7	-0.001	0	7.00	0.58	2.00
8	-59.159	-59	8.00	0.58	2.00
10	-177.463	-177	10.00	0.58	2.00
12	-295.612	-296	12.00	0.58	2.00
14	-414.115	-414	14.00	0.58	2.00

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

Equipment: pH Electrode Type: Combined Electrode  
Manufacturer: METTLER TOLEDO Model: InLab Solids  
Serial No.: 9453943 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	172	98.1	0.0071	2.00
6.866	6.87	6	-	0.0074	2.00
10.015	10.01	-175	97.4	0.0090	2.00
6.983	6.98	-3	-	0.0092	2.00

Certificate No.: 2202093-001-01  
Equipment: Digital Thermometer with RTD (pH Meter)  
Resolution: 0.1 °C Model: SevenEasy pH  
Serial No.: 1230525212 ID No.: UAE.WAS.003/2553  
Manufacturer: METTLER TOLEDO

Date of Calibration: 16 March 2022 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute.  
Environment Condition: Ambient Temperature ( 23.0 ± 1.0 ) °C  
Relative Humidity ( 50 ± 4 ) %

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	1523	2118154	PSLT 085184	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

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

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

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

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

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## Calibration Report

**Certificate No.:** 2202093-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
 Resolution: 0.1 °C Model: SevenEasy pH  
 Serial No.: 1230525212 ID No.: UAE.WAS.0032553  
 Manufacturer: METTLER TOLEDO  
**Date of Calibration:** 16 March 2022 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 120 mm.

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

Dimension of probe: Diameter 3.5 mm, Length 135 mm.

Sheath material: Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.2	15.001	-0.2	0.099
25.2	25.002	-0.2	0.099
35.2	35.002	-0.2	0.099

Note: - UUC\*: Unit Under Calibration

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

----- End -----

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

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CALIBRATION AND TESTING EQUIPMENT SERVICES

53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL: 0-2717-3000-24 FAX: 0-2719-9484

## Certificate of Calibration

Cert.No.: 21CH1017

Page: 1 of 2

**Equipment:** Turbidity Meter  
**Manufacturer:** Oakton  
**Model:** T100IR  
**Serial No.:** 1120501017  
**ID. No.:** UAE.WAT.056/2563  
**Condition As-Received:** Used Item  
**Received Date:** 09 August 2021  
**Calibration Date:** 17 August 2021  
**Reference:** 2108-0201WSC-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 Sirthean

**Approved by:**   
 Approved Signatory

(✓) Malee Butkruea  
 ( ) Sathip Meangmai  
 ( ) Warakorn Lemgagrakul

**Issue Date:** 23 August 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 Calibration and Testing Equipment Services.

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Cert.No.: 21CH1017

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	21H1462	27 June 2022
2) Electronic Balance	1126143764	140RC004	20MM595	27 Sep 2021

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

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000343342	99.5%
2) Hydrazinium Sulfate	HIMEDIA	0000332928	99.2%

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

**Calibration result**

Perform 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	0.0062	2.00
20	20.2	0.39	2.00
100	101	0.72	2.00
400	403	1.5	2.09
800	803	2.1	2.13

**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-



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**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



## 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)  
 Technical Manager  
**Approved by:**   
 (Miss Chonthicha Sangngern)  
 Quality Manager


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

FM-510-02 R03 11/03/201

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## REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 2 of 5

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

Relative humidity  $50 \pm 15$  %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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## REPORT OF CALIBRATION


Certificate No. : SP21-015 Page 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

เอกสารไม่ควบคุม



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## REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 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	2.1192	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

FM-510-02 R03 11/03/201

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## REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 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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**CERTIFICATE OF CALIBRATION**

Certificate No. : SP22-007 Page 1 of 5

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

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064



ID No. : UAE.WAS.006/2552

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by :  Approved by :   
(Mr. Tanawut Rittidach) (Ms. Chonthicha Sangngern)  
Technical Manager Quality Manager

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

FM-708-02 R01 1/11/2021

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

**REPORT OF CALIBRATION**

Certificate No. : SP22-007 Page 2 of 5

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

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

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

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 : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.  
Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

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**REPORT OF CALIBRATION**

Certificate No. : SP22-007 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.577	0.0017	0.0031	2.00
	1.0490	1.050	-0.0010	0.0029	2.00
	2.1900	2.183	0.0070	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.560	0.0007	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.118	0.0049	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.963	0.0004	0.0029	2.00
	1.9763	1.974	0.0023	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	1.000	0.0003	0.0033	2.00
	1.9987	1.996	0.0027	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.082	-0.0011	0.0030	2.00
	2.0391	2.033	0.0061	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.925	0.0044	0.0079	2.00

FM-708-02 R01 1/11/2021

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

**REPORT OF CALIBRATION**

Certificate No. : SP22-007 Page 4 of 5

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.746	0.0018	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.861	0.0076	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.291	0.0002	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.638	0.0068	0.0055	2.00

FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP22-007

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	240.8	0.74	0.18	2.00
279.40	278.5	0.90	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.5	0.72	0.18	2.00
361.26	360.5	0.76	0.18	2.00
418.48	418.0	0.48	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.0	0.20	0.18	2.00
460.06	459.5	0.56	0.18	2.00
536.90	536.0	0.90	0.18	2.00
637.94	637.2	0.74	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.6	0.62	0.18	2.00
513.70	513.0	0.70	0.18	2.00
528.72	528.0	0.72	0.18	2.00
574.60	573.8	0.80	0.18	2.00
585.48	584.6	0.88	0.20	2.00
684.63	684.0	0.63	0.18	2.00
740.27	739.8	0.47	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.4	0.76	0.18	2.00
879.70	878.8	0.90	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

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


- \* Indicates non TISI accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

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



CERTIFICATE OF CALIBRATION

Certificate No. : SP22-008

Page 1 of 5

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

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

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009


ID No. : UAE.WAT.051/2564

Received Date : 20 January 2022

Calibration Date : 20 January 2022


Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by : 

(Mr. Tanawut Rittidach)

Technical Manager

Approved by : 

(Ms. Chonthicha Sangngern)

Quality Manager


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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP22-008

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

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

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

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 : 200 nm/min

Scan Interval of UUC : 0.1 nm.


Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

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



REPORT OF CALIBRATION

Certificate No. : SP22-008

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.576	0.0027	0.0031	2.00
	1.0490	1.046	0.0030	0.0029	2.00
	2.1900	2.182	0.0080	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.559	0.0017	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.116	0.0069	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.962	0.0014	0.0029	2.00
	1.9763	1.970	0.0063	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.519	0.0001	0.0031	2.00
	1.0003	0.999	0.0013	0.0033	2.00
	1.9987	1.992	0.0067	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.080	0.0009	0.0030	2.00
	2.0391	2.031	0.0081	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.560	0.0001	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.922	0.0074	0.0079	2.00

FM-708-02 R01 1/11/2021

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

**REPORT OF CALIBRATION**

Certificate No. : SP22-008 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7478	0.000 0.747	0.0000 0.0008	0.0050 0.0057	2.00 2.00
257	0.0000 0.8686	0.000 0.865	0.0000 0.0036	0.0050 0.0059	2.00 2.00
313	0.0000 0.2912	0.000 0.290	0.0000 0.0012	0.0050 0.0051	2.00 2.00
350	0.0000 0.6448	0.000 0.640	0.0000 0.0048	0.0050 0.0055	2.00 2.00

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

**REPORT OF CALIBRATION**

Certificate No. : SP22-008 Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.0	0.72	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.0	0.81	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.0	0.93	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.0	0.66	0.18	2.00
460.02	459.5	0.52	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	637.5	0.48	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.0	0.50	0.18	2.00
513.47	513.0	0.47	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.0	0.40	0.18	2.00
740.72	740.5	0.22	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.0	0.03	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

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

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

- \* Indicates non TISI accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



## Calibration Certificate

Certificate No.: 2102573-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2102573

Operation No.: 2102573 -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

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 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.: 2102573-001-01  
Equipment: Electronic Balance  
Model: XSR205DU  
Serial No.: C009071872  
Capacity: 81 g / 220 g  
Manufacturer: METTLER TOLEDO  
Resolution: 0.00001 g / 0.0001 g  
ID No.: UAE.WAO.012/2563

Date of Calibration: 26 April 2021

Page 2 of 4

Environment Condition: Ambient Temperature: 23.2 ± 0.1 °C Relative Humidity: 48 ± 2 %

Place of Calibration: Balance Room (208), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-PA-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 B30806854 TCS M21010975 12 January 2022

Standard Weight Class E2 1-500g B308068128 TCS M21010985 13 January 2022

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

Thermo-Hygro Meter PMP-490 NFI/ETH 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:

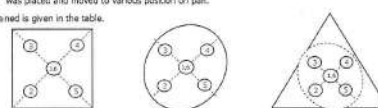
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000048
80	0.000032
100	0.000006
200	0.000006

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	49.9999	50.0001	50.0001	49.9999	50.0000	0.0001

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

เอกสารไม่ควบคุม



## Calibration Report

Certificate No.: 2102573-001-01  
Equipment: Electronic Balance  
Model: XSR205DU  
Serial No.: C00071872  
Capacity: 81 g / 220 g  
Manufacturer: METTLER TOLEDO  
Resolution: 0.0001 g / 0.0001 g  
ID No.: UAE.WAO.012/2563

Date of Calibration: 26 April 2021

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range 0 - 81 g ; Resolution 0.0001 g)

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
0.01	0.010002	0.01003	-0.00003	0.0000091	2.00
0.05	0.050004	0.05004	-0.00004	0.0000099	2.00
0.1	0.100009	0.10003	-0.00003	0.000011	2.00
0.2	0.200002	0.20004	-0.00004	0.000011	2.00
0.5	0.499999	0.50003	-0.00003	0.000014	2.00
1	1.000005	1.00001	0.00000	0.000014	2.00
2	2.000006	2.00001	-0.00001	0.000017	2.00
3	3.000011	3.00001	0.00000	0.000020	2.00
4	4.000014	4.00002	-0.00001	0.000023	2.00
5	5.000002	5.00002	-0.00002	0.000020	2.00
10	9.999989	10.00002	-0.00004	0.000029	2.00
20	19.999988	20.00004	-0.00005	0.000037	2.00
50	49.999903	49.99997	-0.00006	0.000083	2.00
70	69.999891	69.99995	-0.00006	0.00011	2.00
80	79.999871	79.99994	-0.00007	0.00015	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.: 2102573-001-01  
Equipment: Electronic Balance  
Model: XSR205DU  
Serial No.: C00071872  
Capacity: 81 g / 220 g  
Manufacturer: METTLER TOLEDO  
Resolution: 0.0001 g / 0.0001 g  
ID No.: UAE.WAO.012/2563

Date of Calibration: 26 April 2021

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

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

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
82	81.99989	82.0000	-0.0001	0.00012	2.00
85	84.99987	85.0000	-0.0001	0.00013	2.00
90	89.99988	90.0000	-0.0001	0.00013	2.00
95	94.99989	95.0000	-0.0001	0.00014	2.00
100	100.00000	100.0000	0.0000	0.00015	2.00
110	109.99998	110.0000	0.0000	0.00016	2.00
120	119.99999	120.0000	0.0000	0.00017	2.00
150	149.99990	150.0000	-0.0001	0.00020	2.00
170	169.99989	170.0000	-0.0001	0.00023	2.00
200	200.00009	200.0001	0.0000	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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM813  
Page: 1 of 3

## Certificate of Calibration

Equipment: Hot Air Oven  
Manufacturer: Memmert  
Model: UF 55  
Serial No.: B212.0411  
ID No.: UAE.WAO.005/2556  
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:   
( ) Pornthipha Tameyakul  
( ) Malee Butkruea  
( ) Suwit Imjai

Issue Date: 5 May 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

A 0027599



Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2104-0024OC-2  
Result of Calibration: (\*) Without Adjustment  
Function of UUC\*: Temperature Source

Cert. No.: 21TM813  
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
104.0	104.0	104.0	0.13	0.67	0.70	0.68	2
120.0	120.0	120.0	0.10	0.95	1.5	1.1	2
180.0	180.0	180.0	0.15	1.5	2.7	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.712	103.853	104.189	104.213	103.803	103.832	104.026	103.775	103.703
120.0	119.714	119.841	120.552	120.326	119.231	119.293	120.117	119.826	119.721
180.0	179.624	179.511	180.806	180.572	178.397	178.663	180.344	179.807	179.691

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 1052722



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2104-0024-OC-2  
Procedure Used :-

Cert. No.: 21TM813  
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

##### 1. Reference standard instrument:-

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

##### 2. This certification is traceable to the SI unit.

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

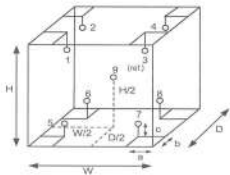
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close



#### Probe Installation Details :

a = 5.0 cm	D = 0.50 m
b = 5.0 cm	W = 0.80 m
c = 5.0 cm	H = 0.75 m
	Capacity = 0.30 m <sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	29
REL.Humid. ( % )	50	54
AC Supply ( Volt )	221	222

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

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a 1052723



National Food Institute, Ministry of Industry, Thailand

2008 Soi 35, Anusorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Certificate

Certificate No.: 2103270-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsak 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



National Food Institute, Ministry of Industry, Thailand

2008 Soi 35, Anusorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## 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 2 of 3

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	M20640405	20 April 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PORPE 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:

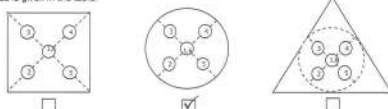
##### 1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
100	0.00067
200	0.00067

##### 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	49.9999	49.9999	50.0000	50.0000	50.0000	0.0001

เอกสารไม่ควบคุม

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



National Food Institute, Ministry of Industry, Thailand

2008 Soi 35, Anusorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 8668 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## 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
Unloaded	0.00000	0.0000	0.0000	0.000092	2.00
0.01	0.01000	0.0100	0.0000	0.000092	2.00
0.05	0.05000	0.0500	0.0000	0.000092	2.00
0.1	0.10001	0.1000	0.0000	0.000093	2.00
0.2	0.20001	0.2001	-0.0001	0.000093	2.00
0.5	0.50001	0.5000	0.0000	0.000093	2.00
1	1.00001	1.0000	0.0000	0.000093	2.00
2	2.00002	2.0001	-0.0001	0.000093	2.00
5	5.00002	4.9999	0.0001	0.000094	2.00
10	10.00001	9.9999	0.0001	0.000096	2.00
20	20.00003	20.0000	0.0000	0.00010	2.00
50	50.00004	50.0000	0.0000	0.00012	2.00
70	70.00007	70.0000	0.0001	0.00014	2.00
100	100.00009	100.0000	0.0001	0.00016	2.00
150	150.00013	150.0000	0.0001	0.00021	2.00
200	200.00016	200.0001	0.0001	0.00028	2.00

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

----- End -----

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

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Cert. No.: 22TM90  
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 : 17 February 2022  
Calibration Date : 17 February 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Kunchit Promprat

Approved by :   
Approved Signatory

( ) Porthippa Tameyakul  
( ) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 22 February 2022

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  
A 0038039



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2202-0446OC-1  
Procedure Used :-

Cert. No.: 22TM90  
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	34970A	MY44035217	21LM30	23 Dec 2022

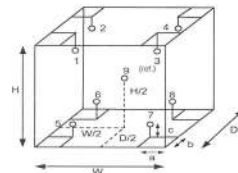
2. This certificate is valid only to the item calibrated on date and place of calibration,

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

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : 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 )	28	28
REL.Humid. ( % )	68	75
AC Supply ( Volt )	226	226

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	22-10RTD-10
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

เอกสารไม่ควบคุม  
A 1096042



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2202-0446OC-1  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 22TM90  
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	19.5	19.4	0.30	0.58	1.0	0.55	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.154	20.013	20.356	19.939	19.834	19.761	19.817	19.824	19.922

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 1096041



Cert. No.: 21TM811  
Page.: 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : ARCO  
Model : UR-1320  
Serial No. : -  
ID No. : UAE.WAO.018/2551  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Lab Floor 2  
Received Order : 21 April 2021  
Calibration Date : 21 April 2021  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Khit Ruttanaprapachai

Approved by :   
Approved Signatory

( ) Porthippa Tameyakul  
( ) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 5 May 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

A 0027600



Equipment : BOD Incubator  
 Condition As-Received : Used Item  
 Reference : 2104-0024DC-3  
 Procedure Used :-

Cert. No.: 21TM811  
 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.

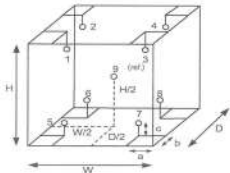
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



#### Probe Installation Details : Dimension of Chamber :

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

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

Position :	Ref. Std./ID No.:
1	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 1052721



Equipment : BOD Incubator  
 Condition As-Received : Used Item  
 Reference : 2104-0024OC-3

Cert. No.: 21TM811  
 Page.: 3 of 3

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

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	20.0	0.15	0.47	0.86	0.31	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
20.0	1	2	3	4	5	6	7	8	9 (ref.)
	20.368	20.509	20.115	20.023	19.826	19.955	20.135	20.269	20.101

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

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

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

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

UUC\* : Unit Under Calibration

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

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

-o0o-

เอกสารไม่ควบคุม

a 1052720



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
 554/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250  
 TEL. 0-2717-3088-27 FAX. 0-2719-9484



Cert. No.: 21TM706  
 Page.: 1 of 3

## Certificate of Calibration

Equipment : Incubator  
 Manufacturer : Memmert  
 Model : IPP260  
 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 : 21 April 2021  
 Calibration Date : 21 April 2021  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %  
 Calibrated by : Kritsada Chaitrong  
 Approved by :   
 Approved Signatory  
 ( ) Pornthippa Tameyakul  
 ( / ) Malee Butkruea  
 ( ) Suwit Imjai

Issue Date : 5 May 2021

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม

A 0027609



Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2104-0019OC-1  
 Procedure Used :-

Cert. No.: 21TM706  
 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	MY44060450	21LM4	NIMT	06 Mar 2022

2. This certification is traceable to the SI unit.

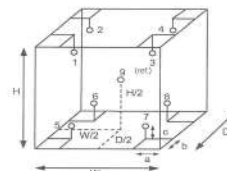
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close



#### Probe Installation Details : Dimension of Chamber :

a = 10 cm	D = 0.50 m
b = 10 cm	W = 0.64 m
c = 10 cm	H = 0.80 m
	Capacity = 0.26 m <sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	23
REL Humid. ( % )	60	63
AC Supply ( Volt )	223	224

Position :	Ref. Std. ID No.:
1	19-14RTD-01
2	19-14RTD-02
3	19-14RTD-03
4	19-14RTD-04
5	19-14RTD-05
6	19-14RTD-06
7	21-14RTD-07
8	19-14RTD-08
9 (ref.)	19-14RTD-09

เอกสารไม่ควบคุม

a 1052708





Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2104-0019OC-1  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 21TM706  
 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
35.0	35.0	35.0	0.11	0.36	0.55	0.30	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 1052707



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.: 21TM1874  
 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,  
 Bangkok, Phrakhanong,  
 Bangkok 10260  
 Location : Microbiology Laboratory (302)  
 Received Order : 28 October 2021  
 Calibration Date : 28 - 29 October 2021  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %  
 Calibrated by : Kunchit Prompratt

Approved by :   
 Approved Signatory

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

Issue Date : 4 November 2021

The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม



Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2110-0698OC-1  
 Procedure Used :-

Cert. No.: 21TM1874  
 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	34970A	MY44067817	21LM10	20 Jul 2022

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

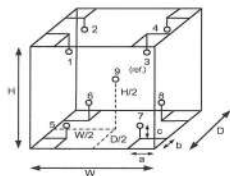
3. This certification is traceable to the International System of Unit.

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

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	22	22
REL.Humid. ( % )	59	60
AC Supply ( Volt )	226	226



**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	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/20
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2110-0698OC-1  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source  
 Fresh air setting : Not Available

Cert. No.: 21TM1874  
 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
25.0	25.0	24.5	0.053	0.25	0.42	0.30	2
35.0	35.0	35.0	0.029	0.43	0.75	0.30	2

Measured Temperature ( °C )									
Calibration Point ( °C )	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
25.0	25.007	24.986	24.943	24.894	24.653	24.806	24.672	24.694	24.786
35.0	35.340	35.384	35.336	35.307	34.680	35.120	34.813	34.996	35.088

**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



Cert. No.: 22TM334  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNE 14  
**Serial No. :** L416.0612  
**ID No. :** UAE.MIC.003/2560  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 17 February 2022  
**Calibration Date :** 17 February 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Suwit Imjai  
**Approved by :**   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
**Issue Date :** 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม

A 0038095



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2202-0444OC-4  
**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:-

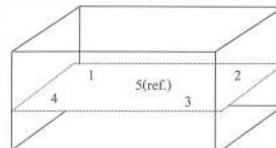
Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

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

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	21	65	229
Finished of Calibration	22	57	230



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม

a 1096055



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2202-0444OC-4  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

Cert. No.: 22TM334  
Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.572	44.514	44.507	44.530	44.565

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.10	0.042	0.15	2

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

a 1096054



Cert. No.: 21TM708  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WNE 14  
**Serial No. :** L414.1407  
**ID No. :** UAE.MIC.006/2568  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 21 April 2021  
**Calibration Date :** 21 April 2021  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Kritsada Chaitrong  
**Approved by :**   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai  
**Issue Date :** 5 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม

a 0027612





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2104-0019OC-4  
Procedure Used :-

Cert. No.: 21TM708  
Page.: 2 of 3

Calibration was 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	MY44060450	21LM4	NIMT	06 Mar 2022

2. This certification is traceable to the SI unit.

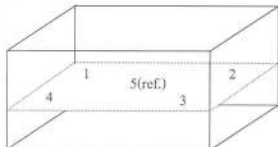
3. This certificate is valid only to the item calibrated on date and place of calibration.

Remark : NIMT : National Institute of Metrology Thailand.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental ( °C )	( %R.H. )	AC Voltage Supply ( Volt )
Beginning of Calibration	24	60	223
Finished of Calibration	23	65	224



Front

Position :	Ref. Std. S/N.:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

Male

เอกสารไม่ควบคุม  
a 1052702



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2104-0019OC-4  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 21TM708  
Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.524	44.507	44.501	44.518	44.518

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.052	0.035	0.16	2

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

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

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

UUC\* : Unit Under Calibration

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

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

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Male

เอกสารไม่ควบคุม  
a 1052701



National Food Institute, Ministry of Industry, Thailand

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



## Calibration Certificate

Certificate No.: 2200705-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Sol Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: MS6035/01  
Serial No.: B007010311  
ID No.: UAE.MIC.008/2553  
Order No.: 2200705  
Operation No.: 2200705-001  
Date of Receipt: 24 November 2021  
Date of Calibration: 24 November 2021

Calibrated by Mr.Jumporn Pimsri  
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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## Calibration Report

Certificate No.: 2200705-001-01  
Equipment: Electronic Balance  
Manufacturer: METTLER TOLEDO  
Model: MS6035/01  
Resolution: 0.001 g  
Serial No.: B007010311  
ID No.: UAE.MIC.008/2553  
Capacity: 620 g

Date of Calibration: 24 November 2021

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Environment Condition: Ambient Temperature: 24.1 ± 0.6 °C Relative Humidity: 48 ± 2.5 %

Place of Calibration: 306 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	9308068594	TCS	M21010975	12 January 2022
Standard Weight Class E2	1-500g	9308068128	TCS	M21010985	13 January 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo Hygro Meter	POMPE 490	NFI.BTH 001/17	Quality Reborn	QR21-0299	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:

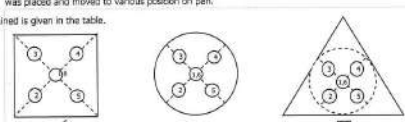
##### 1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
300	0.00952
600	0.00963

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

A mass of 200 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 )
200.001	200.000	200.002	200.001	200.000	200.002	0.002

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

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## Calibration Report

**Certificate No.:** 2200705-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** MS6035/01  
**Resolution:** 0.001 g  
**Serial No.:** 8007010311  
**ID No.:** UAE.MIC.008/2553  
**Capacity:** 620 g

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

**Calibration Results:** (Continued)  
**Calibration Range:** 0-600 g  
**Calibration Adjustment:** Internal Calibration  
**3. Departure from Nominal Value:**

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unloaded	0.0000	0.000	0.000	0.00088	2.00
0.1	0.1000	0.099	0.001	0.00088	2.00
0.5	0.5000	0.500	0.000	0.00088	2.00
1	1.0000	1.000	0.000	0.00088	2.00
5	5.0000	5.000	0.000	0.00088	2.00
10	10.0000	10.000	0.000	0.00088	2.00
20	20.0000	20.000	0.000	0.00089	2.00
50	49.9999	50.001	-0.001	0.00089	2.00
70	69.9999	70.000	0.000	0.00089	2.00
100	100.0000	100.000	0.000	0.00090	2.00
150	149.9999	150.000	0.000	0.00091	2.00
200	200.0001	199.999	0.001	0.00093	2.00
300	300.0001	300.000	0.000	0.00097	2.00
400	400.0000	400.001	-0.001	0.0011	2.00
500	499.9999	500.001	-0.001	0.0012	2.00
600	599.9999	600.000	0.000	0.0013	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

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## Certificate of Calibration

**Cert. No.:** 22TM89  
**Page:** 1 of 3

**Equipment :** Autoclave  
**Manufacturer :** ALP  
**Model :** CL-40L  
**Serial No. :** 802664  
**ID No. :** UAE.MIC.014/2550  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong,  
 Bangkok 10260  
**Location :** Air Analysis Unit  
**Received Order :** 17 February 2022  
**Calibration Date :** 17 February 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Kunchit Promprat  
**Approved by :**   
 Approved Signatory  
 ( ) Ponthippa Tameyakul  
 (✓) Malee Butkruea  
 ( ) Suwit Imjai  
**Issue Date :** 22 February 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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A 0020007



**Equipment :** Autoclave  
**Condition As-Received :** Used Item  
**Reference :** 2202-0444OC-1  
**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 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.

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

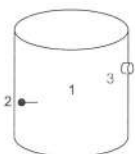
(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

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

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

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



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	27	68	226
Finished of Calibration	27	65	226

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-10TC-01
2 =	Temperature sensor	22-10TC-02
3 =	Exhaust port	22-10TC-03

เอกสารไม่ควบคุม

A 1096061



**Equipment :** Autoclave  
**Condition As-Received :** Used Item  
**Reference :** 2202-0444OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment

**Operating parameter Set :** Temperature = 122 °C  
 Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
122	122	1	122.373	0.32	0.12	1.2	2
		2	122.421				
		3	122.292				

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

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

**UUC\* :** Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

A 1096060