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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
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3383	Jiranatee Associates Co., Ltd.	COF-011-66	31 Aug 23	30 Aug 25	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P1540	24 Apr 25	23 Apr 26	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25P1380	17 Apr 25	16 Apr 26	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25H808	10 Apr 25	9 Apr 26	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C 42C-0508011076	UAE Consultant Co., Ltd.	04102024	4 Oct 24	3 Oct 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Fisher Scientific	42C 0517512000	UAE Consultant Co., Ltd.	04102024	4 Oct 24	3 Oct 25	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C 0517512001	UAE Consultant Co., Ltd.	11102024	11 Oct 24	10 Oct 25	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM08130002	UAE Consultant Co., Ltd.	17092024	17 Sep 24	16 Sep 25	-
9	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050148	UAE Consultant Co., Ltd.	20092024	20 Sep 24	19 Sep 25	-
10	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jul 23	6 Jul 31	-
11	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387061	UAE Consultant Co., Ltd.	06092024	6 Sep 24	5 Sep 25	-
12	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387063	UAE Consultant Co., Ltd.	19062024	19 Jun 24	18 Jun 25	-
13	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387065	UAE Consultant Co., Ltd.	06092024	6 Sep 24	5 Sep 25	-
14	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387066	UAE Consultant Co., Ltd.	06092024	6 Sep 24	5 Sep 25	-

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No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
15	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1201778111	UAE Consultant Co.,Ltd.	06092024	6 Sep 24	5 Sep 25	-
16	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jul 23	6 Jul 31	-
17	Wind Speed/Wind Direction	WS/WD	LSI Lastem	DNA202/E-LOG BQ1705627/17037708	Jiranatee Associates Co., Ltd.	CWS-027-67	7 Aug 24	6 Aug 25	-
18	Wind Speed/Wind Direction	WS/WD	LSI Lastem	DNA202/E-LOG BQ1705626/17037713	Jiranatee Associates Co., Ltd.	CWS-028-67	7 Aug 24	6 Aug 25	-
19	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2205DR0113	Thai Meteorological Department	002/25	3 Jan 25	2 Jan 26	-
20	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DR0072	Thai Meteorological Department	001/25	3 Jan 25	2 Jan 26	-
21	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	24-ACT-086	25 Jun 24	24 Jun 25	-
22	Sound Level Meter	$L_{Aeq\ 24\ hours}, L_{Adn}, L_{A90}, L_{Amax}$	Larson Davis	LxT2	Electrical And Electronics Institute Foundation For Industrial Development	CP20240291EA	5 Aug 24	4 Aug 25	-
				0005396					
23	Sound Level Meter	$L_{Aeq\ 24\ hours}, L_{Adn}, L_{A90}, L_{Amax}$	Larson Davis	LxT2	Innovative Instrument Co.,Ltd.	24-SLM-214	2 Jul 24	1 Jul 25	-
				0005398					
24	Sound Level Meter	$L_{Aeq\ 24\ hours}, L_{Adn}, L_{A90}, L_{Amax}$	Larson Davis	LxT2	Electrical And Electronics Institute Foundation For Industrial Development	CP20240293EA	6 Aug 24	5 Aug 25	-
				0005399					
25	Sound Level Meter	$L_{Aeq\ 24\ hours}, L_{Adn}, L_{A90}, L_{Amax}$	Larson Davis	LxT2	Innovative Instrument Co.,Ltd.	24-SLM-237	10 Jul 24	9 Jul 25	-
				0005393					

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
Workplace									
1	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00321440	Innovative Instrument Co.,Ltd.	25-SLM-106	18 Mar 25	17 Mar 26	-
2	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 01000182	Sithiporn Associates Co., Ltd.	ACL25032	13 Jan 25	12 Jan 26	-
3	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00321432	Innovative Instrument Co.,Ltd.	25-SLM-057	19 Feb 25	18 Feb 26	-
4	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 01010784	Sithiporn Associates Co., Ltd.	ACL25033	13 Jan 25	12 Jan 26	-
5	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00709670	Sithiporn Associates Co., Ltd.	ACL25030	13 Jan 25	12 Jan 26	-
6	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00709682	Sithiporn Associates Co., Ltd.	ACL25031	13 Jan 25	12 Jan 26	-
7	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00409109	Sithiporn Associates Co., Ltd.	ACL25114	28 Jan 25	27 Jan 26	-
8	Sound Level Meter	$L_{Aeq\ 5\ minutes}$, L_{Amax}	Rion, Japan	NL-42 00558206	Sithiporn Associates Co., Ltd.	ACL25192	16 May 25	15 May 26	-
9	Sound Level Meter	$L_{Aeq\ 8\ hours}$, $L_{Aeq\ 12\ hours}$, L_{Amax}	Rion, Japan	NL-42 00408979	Sithiporn Associates Co., Ltd.	ACL25020	13 Jan 25	12 Jan 26	-
10	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV35A 73249	Innovative Instrument Co.,Ltd.	25-ACT-071	20 May 25	19 May 26	-
11	Noise Dosimeter	Noise Dosimeter	Svantek	SV 104IS 128372	Innovative Instrument Co.,Ltd.	25-NDM-066	17 Mar 25	16 Mar 26	-
12	Noise Dosimeter	Noise Dosimeter	Svantek	SV 104IS 128431	Innovative Instrument Co.,Ltd.	25-NDM-046	5 Mar 25	4 Mar 26	-
13	Noise Dosimeter	Noise Dosimeter	Svantek	SV 104IS 128474	Innovative Instrument Co.,Ltd.	25-NDM-063	17 Mar 25	16 Mar 26	-
14	Noise Dosimeter	Noise Dosimeter	Svantek	SV 104 143226	Innovative Instrument Co.,Ltd.	24-NDM-180	16 Jul 24	15 Jul 25	-

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
Workplace									
15	Thermal Environment Monitor	Heat Meter	3M	QuesTemp 32 TPS030008	Innovative Instrument Co.,Ltd.	25-TPM-050	28 Jan 25	27 Jan 26	-
16	Thermal Environment Monitor	Heat Meter	TSI QUEST	QuesTemp 34 TEX040010	Innovative Instrument Co.,Ltd.	24-TPM-321	16 Jul 24	15 Jul 25	-
17	Thermal Environment Monitor	Heat Meter	TSI QUEST	QuesTemp 34 TEX040012	Innovative Instrument Co.,Ltd.	24-TPM-323	16 Jul 24	15 Jul 25	-
18	Thermal Environment Monitor	Heat Meter	TSI QUEST	QuesTemp 34 TEX040016	Innovative Instrument	24-TPM-315	9 Jul 24	8 Jul 25	-
19	Primary Flow Calibrator	Calibrate personal pump	TSI,Inc	4146 41461922008	Innovative Instrument Co., Ltd.	25-AFM-013	15 Jan 25	14 Jan 26	-
20	Aneroid Barometer	Sodium Hydroxide Sulphuric Acid Total Dust Sodium Hypochlorite Total Hydrocarbons Respirable Dust	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25P1359	17 Apr 25	16 Apr 26	-
21	Digital Thermo - Hygrometer	Sodium Hydroxide Sulphuric Acid Total Dust Sodium Hypochlorite Total Hydrocarbons Respirable Dust	Digicon	TH-02 435031148	Technology Promotion Association (Thailand-Japan)	24H1487	15 Jul 24	14 Jul 25	-
22	Total Hydrocarbons Analyzer	Total Hydrocarbons	Thermo Scientific	55i 1182920025	UAE Consultant Co.,Ltd.	01102024	1 Oct 24	30 Sep 25	-
23	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	pH100A JC03354	Technology Promotion Association (Thailand-Japan)	24CH1379	6 Nov 24	5 Nov 25	-
2	DO Meter	DO	Horiba	LAQUA-DO210 HE0L0004	Technology Promotion Association (Thailand-Japan)	24TW241	6 Dec 24	5 Dec 25	-
3	Conductivity Meter	Conductivity	Horiba	LAQUA-EC210 HC0J0020	Technology Promotion Association (Thailand-Japan)	24CH1522	6 Dec 24	5 Dec 25	-

CERTIFICATE OF CALIBRATION

Certificate No. : COP-011-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3383
ID NUMBER : UAE-EFM-063/2560
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 14 Aug 2023
MEASUREMENT DATE : 31 Aug 2023
ISSUE DATE : 01 Sep 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.1 °C and 52.7 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/MC/W2-00. The W2-GU-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of The measurement to recognized the national standards and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: 02231801

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Δp_meter mmHg	Δp_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.699	756.675	23.87	23.04	55.942	1.719	1.311	0.649
2	0.999	756.712	23.89	23.35	62.242	3.451	1.857	0.918
3	1.121	756.709	23.91	23.53	42.168	4.600	2.144	1.059
4	1.166	756.735	24.21	23.79	30.923	5.129	2.363	1.119
5	1.414	756.715	24.31	24.15	30.157	7.612	2.756	1.356

Slope (m): 2.04346

Intercept (k): -0.01758

Correlation coefficient (r): 0.99983

Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Δp_meter mmHg	Δp_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.699	756.675	23.87	23.04	55.942	1.719	0.821	0.649
2	0.999	756.712	23.89	23.35	62.242	3.451	1.164	0.918
3	1.121	756.709	23.91	23.53	42.168	4.600	1.344	1.060
4	1.166	756.735	24.21	23.79	30.923	5.129	1.420	1.119
5	1.414	756.715	24.31	24.15	30.157	7.612	1.730	1.356

Slope (m): 1.27989

Intercept (k): -0.01101

Correlation coefficient (r): 0.99583

Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration

Calibrated by:
☐ Mr. Sitwat Thachad
☒ Mr. Jiragorn Lertsomphol



Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager



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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 25P1540
Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-W/M

Serial No.: -

ID No.: UAE-EFM-076/2566

Condition As-Received: Used item

Received Date: 04 April 2025

Calibration Date: 24 April 2025

Reference: 2504-0192WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1006 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0216-24	24 Sep 2025

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

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

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration D144

Calibrated by: Sukran Khankaw
Issue Date: 28 April 2025

Approved Signatory:
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] A. Hapol Panurach

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Result of calibration: Without adjustment

Function: Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	Low-port side	Δp	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.05	-6.00	12.05	0.05
14.00	7.05	-7.00	14.05	0.05
16.00	8.05	-8.00	16.05	0.05
18.00	9.05	-9.00	18.05	0.05
20.00	10.10	-9.95	20.05	0.05
22.00	11.10	-10.95	22.05	0.05
24.00	12.10	-11.95	24.05	0.05
26.00	13.10	-12.95	26.05	0.05
28.00	14.10	-13.95	28.05	0.05
30.00	15.15	-14.95	30.10	0.10
32.00	16.15	-15.95	32.10	0.10
34.00	17.20	-16.95	34.15	0.15
35.50	17.95	-17.70	35.65	0.15

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* 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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Certificate of Calibration

Certificate No.: 25P1380
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.125/2550

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 17 April 2025

Reference: 2504-0196WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1005 mbar

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

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using "DKD-R 6-1 : Calibration of Pressure Gauges" 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-0133-24	15 May 2025

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Kanekpon Saivichai
Issue Date: 21 April 2025

Approved Signatory:

Attapol P.
[] Phalinee Pratsapaipal
[] Sura Suwannasari
[✓] Attapol Panurach

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Cert.No.: 25P1380
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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)	961.40	971.90	981.62	992.25	1001.35	1009.78	1019.56	1029.44
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	-1.40	-1.90	-1.62	-2.25	-1.35	0.24	0.44	0.56

Decreasing Pressure

Applied Pressure (hPa)	1029.44	1019.30	1009.48	1000.64	991.38	981.80	971.62	961.62
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	0.56	0.70	0.52	-0.54	-1.38	-1.80	-1.62	-1.62

The uncertainty of measurement was ± 0.25 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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Certificate of Calibration

Certificate No.: 25H808
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.004/2548

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 10 April 2025

Reference: 2504-0193WSC

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

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

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

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	22688	10 Sep 2025
2) Handheld Thermometer With Sensor	1521	ASA339	2411176	25 Oct 2025

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

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

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

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

Calibrated by: Krakop Onrat
Issue Date: 18 April 2025

Approved Signatory:

Vipom
[] Chakrit Wawwanjua
[] Pornthippa Tameyakul
[✓] Vipom Tantiyasut

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Cert.No.: 25H808
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Result of Calibration:-

Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Correction (%R.H.)	Uncertainty of Measurement (%R.H.)
25.0	40.1	40	0.1	1.7
25.0	60.0	60	0.0	1.8
25.0	80.0	76	4.0	1.9

Result of Calibration:-

Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.5	-0.488	0.72
25.034	25.0	0.034	0.72
30.032	30.0	0.032	0.72
35.022	34.5	0.522	0.72
40.040	39.0	1.040	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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MULTI-POINT GAS TEST REPORT

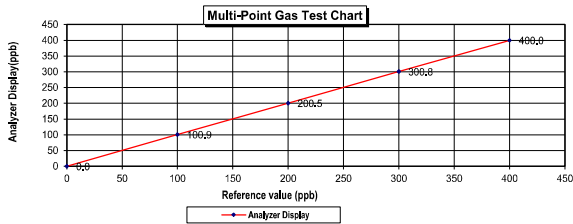
Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.00	0.00	0.00
Level 2 20.00%	100.0	100.9	0.90	0.89
Level 3 40.00%	200.0	200.5	0.50	0.25
Level 4 60.00%	300.0	300.8	0.80	0.27
Level 5 80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.28		



Calculate by *Gurchari*
4 10 2567
Approve by *P. Kham*
4 Oct 2024

MULTI-POINT GAS TEST REPORT

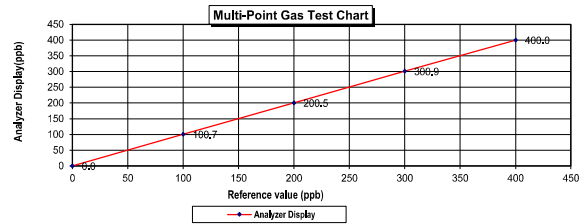
Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.00	0.00	0.00
Level 2 20.00%	100.0	100.7	0.70	0.70
Level 3 40.00%	200.0	200.5	0.50	0.25
Level 4 60.00%	300.0	300.9	0.90	0.30
Level 5 80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.25		



Calculate by *Gurchari*
4 10 2567
Approve by *P. Kham*
4 Oct 2024

MULTI-POINT GAS TEST REPORT

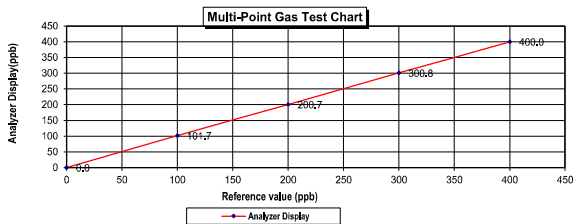
Test Date : Oct 11, 2024

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512001

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.00	0.00	0.00
Level 2 20.00%	100.0	101.7	1.70	1.67
Level 3 40.00%	200.0	200.7	0.70	0.35
Level 4 60.00%	300.0	300.8	0.80	0.27
Level 5 80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.46		



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11 10 2567
Approve by *P. Kham*
11 Oct 2024

MULTI-POINT GAS TEST REPORT

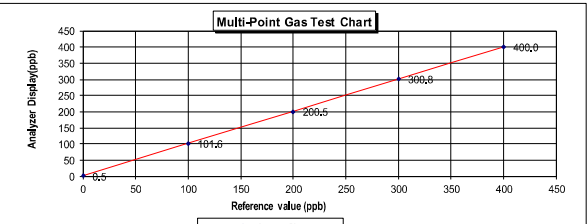
Test Date : Sep 17, 2024

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM08130002

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.50	0.50	0.50
Level 2 20.00%	100.0	101.6	1.60	1.57
Level 3 40.00%	200.0	200.5	0.50	0.25
Level 4 60.00%	300.0	300.8	0.80	0.27
Level 5 80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.52		



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17 9 2567
Approve by *P. Kham*
17 Sep 2024

MULTI-POINT GAS TEST REPORT

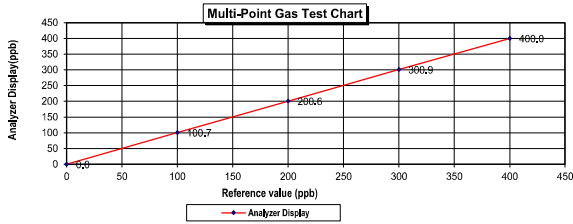
Test Date : Sep 20, 2024

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 6, 2026			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.6	0.60	0.30	0.30
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.26	



Calculate by
S. Chan C.
20 / 9 / 2567

Approve by
P. Khan K.
20 / Sep / 2024

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD :
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" (May 2012) document EPA 800/R-12/031, 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 molar/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/29/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	96.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	153460202002	E90130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.8%	Sep 29, 2025
NTRM	160102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	239001	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The GRM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE6 N1-D8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

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MULTI-POINT GAS TEST REPORT

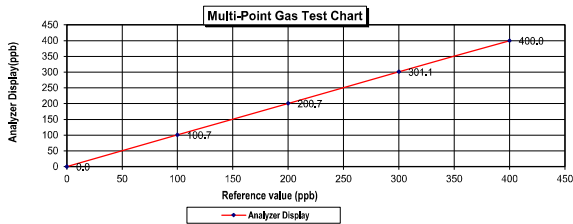
Test Date : Sep 6, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387061

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	301.1	1.10	0.37	0.37
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.28



Calculate by
S. Chan C.
6 / 9 / 2567

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P. Khan K.
6 / Sep / 2024

MULTI-POINT GAS TEST REPORT

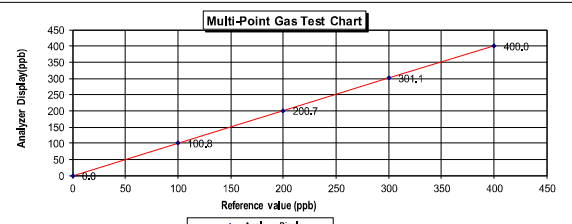
Test Date : June 19, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387063

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.8	0.80	0.79
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	301.1	1.10	0.37
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.30



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S. Chan C.
19 / 06 / 2567

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P. Khan K.
19 / June / 2024

MULTI-POINT GAS TEST REPORT

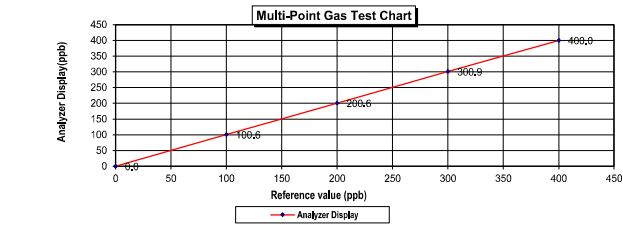
Test Date : Sep 6, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387065

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00
Level 2	20.00%	100.0	0.60	0.60	0.60
Level 3	40.00%	200.0	0.60	0.30	0.30
Level 4	60.00%	300.0	0.90	0.30	0.30
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.24



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MULTI-POINT GAS TEST REPORT

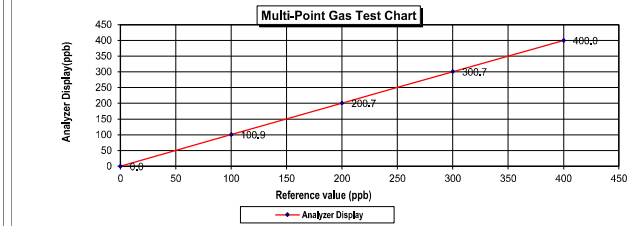
Test Date : Sep 6, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387066

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.9	0.90	0.89	0.89
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.29



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6 / Sep / 2024

MULTI-POINT GAS TEST REPORT

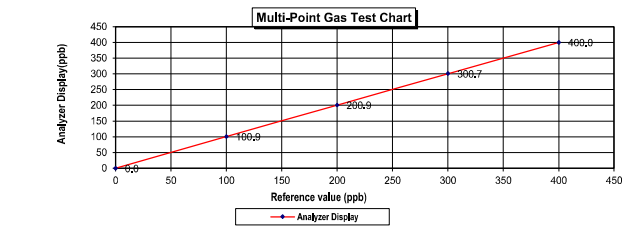
Test Date : Sep 6, 2024

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778111

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	965.9		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.9	0.90	0.45	0.45
Level 4	60.00%	300.0	300.7	0.70	0.23	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.31



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6 / Sep / 2024

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)

Part Number: E05N191E15A0014

Cylinder Number: EB0162121

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12023

Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN

Reference Number: 160-402772205-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 660

Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" (May 2012) document EPA 800/R-12/031, 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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. 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	100.0 PPM	100.4 PPM	G1	+/- 0.5% NIST Traceable	06/27/2023, 07/05/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.5% NIST Traceable	06/27/2023, 07/05/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/05/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/25/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	96.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2319101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	96.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340202002	EB0130037	9.993 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%	Sep 29, 2025
NTRM	180102-22	KAL003620	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411738	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025
The GRM, NTRM, PRM, or RDM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration		
Nicolet iS50 FTIR AUP2010245 CO2	FTIR		Jun 15, 2023		
SIEMENS ULTRAMATE6 N1-D8-180	NDIR		Jun 14, 2023		
Nicolet iS50 FTIR AUP2010245 NO	FTIR		Jun 29, 2023		
Nicolet iS50 FTIR AUP2010245 NO2	FTIR		Jun 15, 2023		
Nicolet iS50 FTIR AUP2010245 SO2	FTIR		Jun 08, 2023		

Approved for Release

Certificate Number

CWS-027-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : ISI Lastem
MODEL/TYPE : Sensor: DINA202
Data logger: E-LOG
SERIAL NUMBER : Sensor: BQ2705627
Data logger: 17037708
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10760

RECEIVED DATE : 02 Aug 2024
MEASUREMENT DATE : 07 Aug 2024
ISSUE DATE : 09 Aug 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

PLACE OF CALIBRATION : Effel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 195 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.217 [-]

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (23.8) °C, (41.5) %RH and (1009.0) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thaisakul
☐ Miss Jittaporn Lerttanaporn



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

- ¹ Netting cross-section area of the wind tunnel
- ² Projected cross-section area of the tested object include mounting pipe
- ³ Diameter of mounting pipe
- ⁴ Ratio $\frac{A}{A_0}$

เอกสารไม่ควบคุม

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

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V_{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{ref} (m/s)	Error (m/s)	U (k=2) (m/s)
1.093	23.98	24.05	0.9	-0.2	0.31
2.051	24.24	24.05	1.8	-0.3	0.31
3.124	24.02	24.05	2.9	-0.2	0.31
4.086	24.04	24.05	3.8	-0.3	0.31
5.09	23.68	24.05	4.9	-0.2	0.31
6.08	23.84	24.05	5.9	-0.3	0.31
6.99	23.52	24.05	6.8	-0.2	0.31
8.16	24.48	24.05	8.0	-0.3	0.31
9.12	23.50	24.05	9.1	-0.1	0.31
9.98	24.02	24.05	9.9	-0.1	0.31
11.04	23.46	24.05	11.1	0.0	0.31
12.05	23.64	24.05	12.1	0.1	0.31
13.02	23.46	24.05	13.0	-0.1	0.31
13.96	23.50	24.05	14.0	0.1	0.35
15.03	23.52	24.05	15.1	0.1	0.39
16.00	23.50	24.05	16.0	0.0	0.34

Remarks:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.



เอกสารไม่ควบคุม

Certificate Number

CWD-027-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : ISI Lastem
MODEL/TYPE : Sensor: DINA212
Data logger: E-LOG
SERIAL NUMBER : Sensor: 19020250
Data logger: 17037708
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10760

RECEIVED DATE : 07 Aug 2024
MEASUREMENT DATE : 08 Aug 2024
ISSUE DATE : 09 Aug 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

PLACE OF CALIBRATION : Effel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 52 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.058 [-]

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (24.9) °C, (45.1) %RH and (1005.2) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thaisakul
☐ Miss Jittaporn Lerttanaporn



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

- ¹ Netting cross-section area of the wind tunnel
- ² Projected cross-section area of the tested object include mounting pipe
- ³ Diameter of mounting pipe
- ⁴ Ratio $\frac{A}{A_0}$

เอกสารไม่ควบคุม

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

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

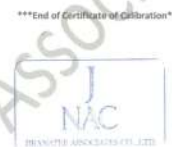
Air speed m/s	D ¹ _{90°} Degree (°)	D ¹ _{45°} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.01	0.000	0	0	0.80
	45.000	46	1	0.80
	90.000	90	0	0.80
	135.000	135	0	0.80
	180.000	180	0	0.80
	225.000	225	0	0.80
	270.000	269	-1	0.80
	315.000	314	-1	0.80

Remarks:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Direction of standard

³ Direction of Unit Under Calibration



เอกสารไม่ควบคุม

Certificate Number
CWS-028-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : ISI Lastem
MODEL/TYPE : Sensor: DNA202
Data logger: E-LOG
SERIAL NUMBER : Sensor: B021705276
Data logger: 17037713
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260

RECEIVED DATE : 02 Aug 2024
MEASUREMENT DATE : 07 Aug 2024
ISSUE DATE : 09 Aug 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 195 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.217 [-]

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (24.5) °C, (43.0) %RH and (1009.1) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thairakul
☐ Miss Jitraporn Lertapornphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

¹ Validity cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio to ¹

Calibration procedure:

The Cup anemometer was calibrated against standard air velocity transducer model: B455-82 and pitot tube with precision differential pressure meter model: DPMS200 in an Eiffel-type wind tunnel of Eiffel-type wind tunnel with 900 cm² cross section area. The W-CL-007 based on IEC 61400-12-2: Wind energy generation systems - Part 12-2: Power performance measurement of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate Number: MW-0007-24 and MW-0055-23

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{ref} (m/s)	Error (m/s)	U (k=2) (m/s)
1.001	24.08	24.75	0.92	-0.19	0.21
2.056	25.40	24.75	1.84	-0.22	0.31
3.148	24.10	24.75	2.91	-0.23	0.31
4.060	24.10	24.75	3.76	-0.30	0.31
5.10	23.80	24.75	4.91	-0.19	0.31
6.05	25.50	24.75	5.91	-0.23	0.31
6.99	23.90	24.75	6.83	-0.16	0.31
8.11	25.08	24.75	7.99	-0.12	0.31
9.12	24.10	24.75	9.06	-0.06	0.31
9.96	24.70	24.75	9.90	-0.06	0.31
11.05	24.20	24.75	11.05	0.00	0.31
12.01	24.52	24.75	11.97	-0.04	0.35
13.05	24.30	24.75	12.96	-0.07	0.31
13.99	24.44	24.75	13.96	-0.03	0.36
15.00	24.30	24.75	14.96	-0.04	0.37
16.01	24.30	24.75	16.02	0.01	0.34

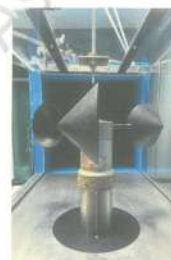
Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry



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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Certificate Number
CWD-028-67

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : ISI Lastem
MODEL/TYPE : Sensor: DNA212
Data logger: E-LOG
SERIAL NUMBER : Sensor: 13650293
Data logger: 17037713
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260

RECEIVED DATE : 02 Aug 2024
MEASUREMENT DATE : 08 Aug 2024
ISSUE DATE : 09 Aug 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 52 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.058 [-]

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (24.3) °C, (45.1) %RH and (1005.1) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thairakul
☐ Miss Jitraporn Lertapornphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

¹ Validity cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio to ¹

Calibration procedure:

The wind direction sensor was calibrated against standard rotary encoder, model: AR40955, DMD4-P3-S-UG in an Eiffel-type wind tunnel of Eiffel-type wind tunnel with 900 cm² cross section area. The W-CL-008 based on IEC 61400-12-2: Wind energy generation systems - Part 12-2: Power performance measurement of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate Number: DA-0036-23.

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D ₁₀₀ Degree (°)	D ₁₀₀ Degree (°)	Error Degree (°)	U (k=2) Degree (°)
	0.000	0	0	0.80
	45.000	46	1	0.80
	90.000	91	1	0.80
	135.000	136	1	0.80
	180.000	181	1	0.80
	225.000	226	1	0.80
	270.000	270	0	0.80
	315.000	315	0	0.80

Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Direction of standard

³ Direction of Unit Under Calibration



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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 3 January, 2025

Certification No. 002/25

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2205DR0113

Wind Sensor 2205DT0113

Customer : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,

Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1012.6 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Airt Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: testo, testo 645 Serial No. 02848057 : Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB335 No. K4320001

Calibrated by :

Signed :

Mr. Pirood Promsot

(Authorized Signatory)

For The Effect

Sub-Standard Instrument

Mr. Watcharapol Subwat

Mechanical Engineer

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

3 January, 2025

Certification No. 002/25

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Vane Angel Bench Stand Model 18112	
Young Meteorological Instruments	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 002/25

3 January, 2025

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1012.05	1012	0.05
1011.25	1011	0.25
1012.92	1013	-0.08
1010.09	1010	0.09
1008.87	1009	-0.13
1010.43	1010	0.43
1011.39	1011	0.39
1011.05	1011	0.05
1010.72	1011	-0.28
1010.30	1010	0.30
1009.81	1010	-0.19
1008.93	1009	-0.07
1009.35	1009	0.35
1009.89	1010	-0.11
1010.57	1011	-0.43
1011.41	1012	-0.59
1012.31	1012	0.31
1009.75	1010	-0.25
1010.67	1011	-0.33
1011.01	1011	0.01

Average

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

3 January, 2025

Certification No. 002/25

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
759.10	759	0.10
758.50	759	-0.50
759.75	760	-0.25
757.63	757	0.63
756.71	757	-0.29
757.88	758	-0.12
758.60	758	0.60
758.35	758	0.35
758.10	758	0.10
757.79	758	-0.21
757.42	757	0.42
758.76	757	-0.24
757.07	757	0.07
757.48	758	-0.52
757.99	758	-0.01
758.62	759	-0.38
759.29	759	0.29
757.37	757	0.37
758.06	758	0.06
758.32	758	0.32

Average

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

3 January, 2025

Certification No. 002/25

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45	0.5
30.4	30	0.4
15.6	15	0.6

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 3 January, 2025

Certification No. 001/25

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2111DR0072
Wind Sensor 2111DR0072

Customer : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1012.1 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO. 1425

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Testo, testo 545 Serial No. 02848057 : Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB220 No. V1220015

Calibrated by : *Watchapol*

Signed : *Mr. Pisood Promsrit*

Mr. Watchapol Subwat
Mechanical Engineer

Mr. Pisood Promsrit

(Authorized Signatory)

For the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

3 January, 2025

Certification No. 001/25

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.1	-0.08
20.02	-	-	-	20.1	-0.08

Vane Angel Bench Stand Model 18112 Young Meteorological Instruments	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

3 January, 2025

Certification No. 001/25

Page : 3 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction mbar
1012.05	1012	0.05
1011.25	1011	0.25
1012.92	1013	-0.06
1010.09	1010	0.09
1008.87	1009	-0.13
1010.43	1010	0.43
1011.39	1011	0.39
1011.05	1011	0.05
1010.72	1011	-0.28
1010.30	1010	0.30
1009.81	1010	-0.19
1008.93	1009	-0.07
1009.35	1009	0.35
1009.89	1010	-0.11
1010.57	1011	-0.43
1011.41	1011	0.41
1012.31	1012	0.31
1009.75	1010	-0.25
1010.67	1011	-0.33
1011.01	1011	0.01

Average

Calibrated by : *Watchapol*
Mr. Watchapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 001/25

3 January, 2025

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
759.10	759	0.10
758.50	759	-0.50
759.75	760	-0.25
757.63	758	-0.37
756.71	757	-0.29
757.88	758	-0.12
758.90	759	-0.40
756.36	758	0.36
758.10	758	0.10
757.79	758	-0.21
757.42	757	0.42
756.76	757	-0.24
757.07	757	0.07
757.48	757	0.48
757.99	758	-0.01
758.62	759	-0.38
759.29	759	0.29
757.37	757	0.37
758.06	758	0.06
758.32	758	0.32

Average

Calibrated by :

Handwritten signature

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 001/25

3 January, 2025

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45	0.5
30.4	30	0.4
15.6	16	-0.4

Calibrated by :

Handwritten signature

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10140 THAILAND
TEL: 0609-2116-5809-1 FAX: 0609-2116-7140



INNOVATIVE
Calibration & Test Section



Page 1 of 3

Certificate of Calibration

Customer

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

Certificate No : 24-ACT-086
Request No : Req-2024-1364

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : LARSON DAVIS
Model : CAL150
Serial Number : 6171
ID : UAE-EFM117/2562
Class : 2
Range : 94 , 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 20 June 2024
Calibration Date : 25 June 2024
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	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

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 :

Handwritten signature

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Handwritten signature

Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 25 June 2024

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,
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INNOVATIVE
Calibration & Test Section



Page 2 of 3

Certificate No : 24-ACT-086

Request No : Req-2024-1364

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.99	-0.01	-	-	0.13	0.40	Pass
114 dB / 1000 Hz	114.02	0.02	-	-	0.14	0.40	Pass

Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)	Result
	Measured (%)	Deviated (%)	Measured (%)	Deviated (%)			
94 dB / 1000 Hz	0.05	-	-	-	0.40	3.0	Pass
114 dB / 1000 Hz	0.30	-	-	-	0.40	3.0	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.35 dB
Frequency	0.20%
Total distortion+noise	1.00%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibration pressure correction

- The calibration results exclude the microphone volume correction

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Certificate No : 24-ACT-086
Request No : Req-2024-1364

Decision Rule for Statements of Conformity

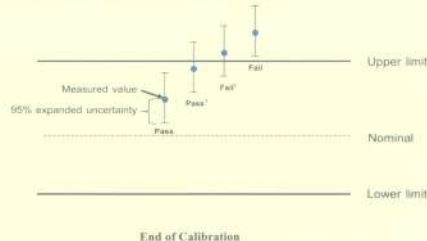
The standard decision rule employed for the statements of conformity to such calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement is 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement is 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.




The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Institute.
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FM-FDB-ACT-02 Rev.03 Issue date 5/6/24

Certificate No.: CP20240291EA
Operation No.: CP2024070254

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT2 (Meter), 375A04B02 (Microphone), PRMLxT2C (Preamplifier)
Serial No.: 0005396 (Meter), 329350 (Microphone), 073805 (Preamplifier)
ID No.: UAE.EFM.033/2564
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except
with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1

ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240291EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT2 (Meter), 375A04B02 (Microphone), PRMLxT2C (Preamplifier)
Serial No.: 0005396 (Meter), 329350 (Microphone), 073805 (Preamplifier)
ID No.: UAE.EFM.033/2564
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240291EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
29.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting (dB)	Measured value (dB)
A-weighting	29.1
C-weighting	28.8
Z-weighting	34.1

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.1	0.3	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	0.2	0.2	0.2	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	-0.1	0.0	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

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Certificate No.: CP20240291EA

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.1	0.1	±1.1
139.0	139.1	0.1	±1.1
140.0	140.1	0.1	±1.1
141.0	141.1	0.1	±1.1

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Certificate No.: CP20240291EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.1	0.1	±1.1
43.0	43.1	0.1	±1.1
42.0	42.2	0.2	±1.1
41.0	41.2	0.2	±1.1
40.0	40.3	0.3	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±1.0
	2	118.8	-0.2	+1.0 ; -2.5
	0.25	109.8	-0.2	+1.5 ; -5.0
Slow	200	129.5	-0.1	±1.0
	2	109.9	-0.1	+1.0 ; -5.0
	0.25	130.0	0.0	±1.0
LAE	2	110.0	0.0	+1.0 ; -2.5
	0.25	101.0	0.0	+1.5 ; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±3.0
Positive half cycle	134.4	134.0	-0.4	±2.0
Negative half cycle	134.4	134.0	-0.4	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.4	143.4	0.0	±1.5

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Certificate No.: CP20240291EA

Calibration Report

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.55
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 2.
 4. The coverage factor $k = 2.00$

-- End of Report --

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INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/130 MOO 13, SOI 8 SUTINAKORN 11 LAMBOO BANG KALOE,

AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND

TEL : 06-09-2116-5869 FAX : 06-09-2116-7140



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Certificate of Calibration

Customer

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

Certificate No : 24-SLM-214
Request No : Req-2024-1379

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : Larson Davis
Model : LxT2
Serial Number : 0005398
ID : UAE.EFM.635/2664
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 338075
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 : 24 June 2024
Calibrated Date : 2 July 2024
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	20 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	FFA000234	28 July 2024	TSI
Audio Generator	Svante	Scan401	131	8 October 2024	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 Luangrat
Service Calibration Engineer

Approved By : 
Mr. Paet Muthavorn
Calibration Engineer Supervisor
Issue Date : 2 July 2024

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

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FSL-001-01-01 Rev.04 Issue date 1/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting (dB)								
1000 Hz 114 dB	113.76	114.0	0.24	113.8	-0.04	0.20	0.30	Pass

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	28.8	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	28.1	0.10
C	27.9	0.10
Z	32.1	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)	Result
FAST / 37-139	A	C	Z			
STD Setting (dB)	(dB)	(dB)	(dB)			
125 Hz	-0.1	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.6	0.6	0.60	3.0	Pass
8000 Hz	0.5	0.4	0.4	0.70	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
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File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

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)	Result
FAST / 37-139	A (dB)	C (dB)	Z (dB)			
STD Setting	(dB)	(dB)	(dB)			
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.0	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.1	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.1		3.0	Pass
8000 Hz	0.0	0.0	0.1		5.0	Pass
16000 Hz	0.0	0.0	-0.1		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	REF	UUC (dB)	ERR (dB)			
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Lsq	114.00	114.0	0.0		0.10	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
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File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	REF	UUC (dB)	ERR (dB)			
STD dB	(dB)	(dB)	(dB)			
110.00	130	129.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
89.00	89	88.9	-0.1		1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
79.00	79	78.9	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
69.00	69	68.9	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
59.00	59	58.9	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.3	0.3		1.1	Pass
34.00	34	34.4	0.4		1.1	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
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File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A	REF	UUC (dB)	ERR (dB)			
UUC Range	(dB)	(dB)	(dB)			
37-139	43.60	43.7	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 37-139	Toneburst	Ref	UUC (dB)	ERR (dB)			
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.6	-0.2		+1.0, -2.5	Pass
	0.25	109.0	108.6	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass
SEL	200	129.0	129.0	0.0		1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
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File: 708-51.34-01 Rev.04 Issue date: 5/6/24



Certificate No : 24-SLM-214
Request No : Req-2024-1379

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)		(\pm dB)	
Positive one-half cycle	142.0			
Negative one-half cycle	142.1			
Deviated	-0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)		(± dB)	
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FM-708-SL-S4-01 Rev.04 Issue date 5/6/24



Certificate No : 24-SLM-214
Request No : Req-2024-1379

Decision Rule for Statements of Conformity

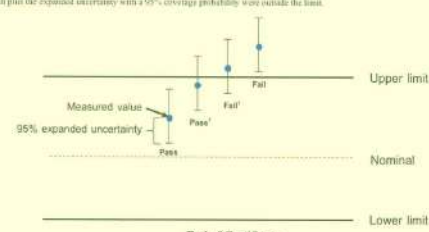
The standard decision rule employed for the statement of conformity to each calibration result will be applied using IEC-08:09:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass' = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail' = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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 Calibration Laboratory.

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FM-708-SL-S4-01 Rev.04 Issue date 5/6/24



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240293EA
Operation No.: CP2024070256

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT2 (Meter), 375B02 (Microphone), PRMLxT2B (Preamplifier)
Serial No.: 0005399 (Meter), 11789 (Microphone), 056125 (Preamplifier)
ID No.: UAE.EFM.036/2564
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 6 - 7 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240293EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT2 (Meter), 375B02 (Microphone), PRMLxT2B (Preamplifier)
Serial No.: 0005399 (Meter), 11789 (Microphone), 056125 (Preamplifier)
ID No.: UAE.EFM.036/2564
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 15) %
Pressure: (101.3 \pm 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Certificate No.: CP20240293EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
30.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	29.5
C-weighting	28.9
Z-weighting	34.4

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.0	0.1	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	1.9	1.9	1.9	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.1	±1.5
250	-0.1	0.0	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	-0.1	0.0	0.0	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

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Certificate No.: CP20240293EA

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.1	0.1	±1.1
139.0	139.1	0.1	±1.1
140.0	140.1	0.1	±1.1
141.0	141.1	0.1	±1.1

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Certificate No.: CP20240293EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.1	0.1	±1.1
43.0	43.2	0.2	±1.1
42.0	42.2	0.2	±1.1
41.0	41.3	0.3	±1.1
40.0	40.4	0.4	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±1.0
	2	118.8	-0.2	+1.0 ; -2.5
	0.25	109.6	-0.4	+1.5 ; -5.0
Slow	200	129.5	-0.1	±1.0
	2	109.9	-0.1	+1.0 ; -5.0
	0.25	130.0	0.0	±1.0
LAE	2	110.0	0.0	+1.0 ; -2.5
	0.25	100.8	-0.2	+1.5 ; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.7	-0.7	±3.0
Positive half cycle	134.4	134.1	-0.3	±2.0
Negative half cycle	134.4	134.1	-0.3	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.5	-0.1	±1.5

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Certificate No.: CP20240293EA

Calibration Report

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was IEC61672-3:2013 Class 2.
 4. The coverage factor $k = 2.00$

-- End of Report --

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Customer

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

Certificate No : 24-SLM-237
Request No : Req-2024-1456

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : Larson Davis
Model : LX72
Serial Number : 0605193
ID : UAL-EFM.0302564
Resolution : 0.1 dB

Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 329354
Preamplifier Model : PRMLX12C
Preamplifier S/N : 073808
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 1 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 1 July 2024
Calibrated Date : 10 July 2024
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	28 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	131	8 October 2024	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. Noppanon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pakt Marthayorn
Calibration Engineer Supervisor
Issue Date : 10 July 2024

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting	(dB)							
1000 Hz 114 dB	113.76	114.3	0.54	113.8	+0.04	0.20	0.30	Pass

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 (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.7	0.10

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.4	0.10
C	28.4	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 (± dB)	Acceptance Limit (± dB)	Result
	A	C	Z			
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.80	1.0	Pass
4000 Hz	0.6	0.6	0.6	0.80	3.0	Pass
8000 Hz	0.3	0.3	0.4	0.70	5.0	Pass

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)	Result
	A (dB)	C (dB)	Z (dB)			
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0	0.20	1.5	Pass
250 Hz	-0.1	0.0	0.0	0.20	1.5	Pass
500 Hz	0.0	0.0	0.0	0.20	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.20	1.0	Pass
2000 Hz	0.0	0.1	0.0	0.20	2.0	Pass
4000 Hz	0.0	0.0	0.0	0.20	3.0	Pass
8000 Hz	0.0	0.0	0.0	0.20	5.0	Pass
56000 Hz	-0.1	-0.1	-0.1	0.20	+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)	
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0	0.20	0.20	Pass
Z	114.00	114.0	0.0	0.20	0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
37-139 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0	0.20	0.10	Pass
Leq	114.00	114.0	0.0	0.20	0.10	Pass

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC (dB)			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
FAST / A / 37-139	REF	(dB)	(dB)	(± dB)	(± dB)	
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0	0.30	1.1	Pass
129.00	129	129.0	0.0	0.30	1.1	Pass
124.00	124	124.0	0.0	0.30	1.1	Pass
119.00	119	119.0	0.0	0.30	1.1	Pass
114.00	114	114.0	0.0	0.30	1.1	Pass
109.00	109	109.0	0.0	0.30	1.1	Pass
104.00	104	104.0	0.0	0.30	1.1	Pass
99.00	99	99.0	0.0	0.30	1.1	Pass
94.00	94	94.0	0.0	0.30	1.1	Pass
89.00	89	89.0	0.0	0.30	1.1	Pass
84.00	84	84.0	0.0	0.30	1.1	Pass
79.00	79	79.0	0.0	0.30	1.1	Pass
74.00	74	74.0	0.0	0.30	1.1	Pass
69.00	69	69.0	0.0	0.30	1.1	Pass
64.00	64	64.0	0.0	0.30	1.1	Pass
59.00	59	59.0	0.0	0.30	1.1	Pass
54.00	54	54.0	0.0	0.30	1.1	Pass
49.00	49	49.0	0.0	0.30	1.1	Pass
44.00	44	44.3	0.3	0.30	1.1	Pass
39.00	39	39.4	0.4	0.30	1.1	Pass
34.00	34	34.5	0.5	0.30	1.1	Pass

Certificate No : 24-SLM-237
Request No : Req-2024-1456

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	REF	UUC	ERR			
FAST / A	(dB)	(dB)	(dB)	0.30	1.1	Pass
UUC Range	43.80	43.9	0.1			
	114	114.0	0.0			
37-139						

10. Tone burst response

UUC Setting	STD	Anticipated Ref	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	Toneburst		UUC	ERR			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.20	1.0	Pass
Fast	200	135.0	134.9	-0.1			
	2	118.0	117.9	-0.1			
	0.25	109.0	108.7	-0.3			
Slow	200	128.6	128.4	-0.2			
	2	109.0	108.8	-0.2			
	200	129.0	129.0	0.0			
SEL	2	109.0	109.1	+0.1			
	0.25	100.0	99.9	-0.1			

11. Peak C Sound level

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-237
Request No : Req-2024-1456

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	0.20	1.5	Pass
Positive one-half cycle	142.6			
Negative one-half cycle	142.6			
Deviated	0.0			

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)	0.10	0.30	Pass
Initial	138.0			
Final	138.0			
Deviated	0.0			

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.80 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance Limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-237
Request No : Req-2024-1456

Decision Rule for Statements of Conformity

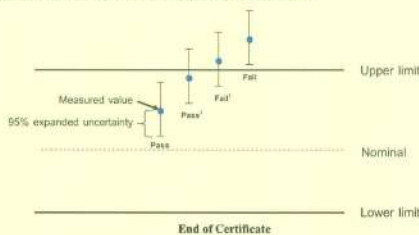
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass^u = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail^l = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability is not outside the limit.



End of Certificate

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

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 24-SLM-106
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2024-0478
10260

Unit Under Calibration Details

Measurement Item : Sound Level Meter Microphone Class : 2
Manufacturer : RION Microphone Model : UC-52
Model : NL-42 Microphone S/N : 150391
Serial Number : 00321440 Preamplifier Model : NH-24
ID : UAE.EMA2.089/2555 Preamplifier S/N : 11460
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 : 19 February 2025
Calibrated Date : 18 March 2025
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Briel & Kjaer	4192	2294985	25 June 2025	NIMT
Audio Generator	Svante	Sva401	131	15 October 2025	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 Luangart
Service Calibration Engineer

Approved By :
Mr. Pacit Mathavom
Calibration Engineer Supervisor
Issue Date : 18 March 2025

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz 114.03	114.03	114.1	-0.07	114.0	-0.03	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SYANTEK, Model SY 33, SN 44792

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	19.3	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	13.2	0.10
C	16.8	0.10
Z	21.0	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)	Result
	A	C	Z			
FAST / 30-130	(dB)	(dB)	(dB)			
STD Setting	(dB)	(dB)	(dB)			
125 Hz	0.0	0.2	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	-0.2	-0.2	-0.2	0.60	3.0	Pass
8000 Hz	-2.5	-2.4	-2.5	0.70	5.0	Pass

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FM-708-SLM-01 Rev 04 Issue date 5/6/24

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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)	Result
FAST / 30-130	A (dB)	C (dB)	Z (dB)			
STD Setting	(dB)	(dB)	(dB)			
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.3	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	0.1	0.1	0.0		5.0	Pass
16000 Hz	-1.3	-1.4	0.0		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 30-130	REF	UUC (dB)	ERR (dB)			
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
30-130 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Log	114.00	114.0	0.0		0.10	Pass

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FM-708-SLM-01 Rev 04 Issue date 5/6/24

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7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	REF	UUC (dB)	ERR (dB)			
STD dB	(dB)	(dB)	(dB)			
138.00	138	137.9	-0.1	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	128.9	-0.1		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.0	0.0		1.1	Pass
34.00	34	34.0	0.0		1.1	Pass
29.00	29	29.1	0.1		1.1	Pass
24.00	24	24.0	0.0		1.1	Pass

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9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A	REF	UUC (dB)	ERR (dB)			
UUC Range	(dB)	(dB)	(dB)			
30-130	29.30	29.4	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 30-130	Toneburst	Ref	UUC (dB)	ERR (dB)			
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
Fast	200	126.0	126.0	0.0	0.20	1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -5.0	Pass
	200	120.0	120.0	0.0		1.0	Pass
SEL	2	100.0	100.0	0.0		+1.0, -2.5	Pass
	0.25	91.0	90.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / C / 55-141	REF	UUC (dB)	ERR (dB)			
STD Setting	(dB)	(dB)	(dB)			
Complete cycle	136.4	136.4	0.00	0.20	3.0	Pass
Positive half cycle	135.4	135.2	-0.20		2.0	Pass
Negative half cycle	135.4	135.2	-0.20		2.0	Pass

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FM-708-SLM-01 Rev 04 Issue date 5/6/24

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Certificate No : 25-SLM-106
Request No : Req-2025-0478

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC	(\pm dB)	(\pm dB)	
STD Setting	(dB)			
Positive one-half cycle	139.6			
Negative one-half cycle	139.4			
Deviated	0.2	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC	(\pm dB)	(\pm dB)	
STD Setting	(dB)			
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.29 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FM-708-SLM-01 Rev 04 Issue date: 5/5/24

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Certificate No : 25-SLM-106
Request No : Req-2025-0478

Decision Rule for Statements of Conformity

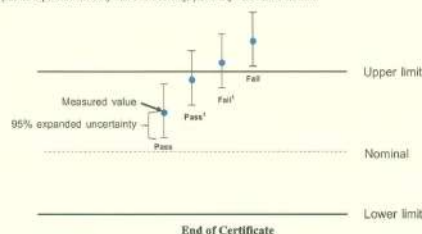
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2013; Guidelines on the Reporting of Compliance with Specification at following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was not of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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

FM-708-SLM-01 Rev 04 Issue date: 5/5/24

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SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-45/1 Sirthiporn Road, Bangturnnu, Bangkok, 10700 Thailand
Tel: +66 2433 8531 Email: calibration@sithiporn.com



Cert. No. : ACL25032
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01000182 / 187202 / 01844
ID No.: UAE.EFM.024/2564

Condition As Found : GOOD

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

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

Received Date : 03 JANUARY 2025
Calibration Date : 13 - 14 JANUARY 2025
Date of Issue : 15 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchurai
(Thanakul Petchurai)

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

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SITHIPORN associates

SITHIPORN ASSOCIATES CALIBRATION LABORATORY

Cert. No. : ACL25032
Job No. : VC68AC0056
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

เอกสารไม่ควบคุม

Cert. No. : ACL25032
Job No. : VC68AC0056
Pages : 3 of 8

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

Cert. No. : ACL25032
Job No. : VC68AC0056
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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Cert. No. : ACL25032
Job No. : VC68AC0056
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	1.4	1.5	1.5	±5.0

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Cert. No. : ACL25032
Job No. : VC68AC0056
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

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Job No. : VC68AC0056
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.1	0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	-0.1	±1.5
89.6	89.5		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7130 MOO 14, SOI SUNTINAKORN 11 TAMBON BANG KAE, AO
AMPHIE BANG PHU SAMUT PRAKARN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140



Page: 1/7

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-SLM-057
Address : 81 Soi Udomsak 41, Sakhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2025-0401

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : RION Microphone Model : UC-52
Model : NL-42 Microphone S/N : 139073
Serial Number : 00321432 Preamplifier Model : NH-24
ID : UAE.EMA2.081/2555 Preamplifier S/N : 11452
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 : 13 February 2025
Calibrated Date : 19 February 2025
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	Brüel & Kjær	4192	2294985	25 June 2025	NIMT
Audio Generator	Svaniek	Svan991	131	15 October 2025	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 Luangant
Service Calibration Engineer

Approved By :
Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 19 February 2025

เอกสารไม่ควบคุม

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Certificate No : 25-SLM-057
Request No : Req-2025-0401

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR	(± dB)	(± dB)	Pass
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz 114 dB	113.76	113.5	-0.26	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN:59079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130	(dB)	(± dB)
UUC Weighting		
A	22.0	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130	(dB)	(± dB)
UUC Weighting		
A	14.5	0.10
C	19.3	0.10
Z	22.8	0.10

4. Acoustic signal test of frequency weightings (Without Windscreens)

UUC Setting	Deviation from various Frequency Weighting Respnse curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A	C	Z	(± dB)	(± dB)	Pass
STD Setting	(dB)	(dB)	(dB)			
125 Hz	1.3	1.3	1.3	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	-0.1	-0.2	-0.1	0.60	3.0	Pass
8000 Hz	-2.6	-2.6	-2.6	0.70	5.0	Pass

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.

P50-708-SLM-01 Rev.04 Issue date 5/8/24

Certificate No : 25-SLM-057
Request No : Req-2025-0401

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)	Result
	FAST / 30-130					
STD Setting	A (dB)	C (dB)	Z (dB)	0.20	2.0	Pass
63 Hz	-0.3	-0.1	0.0			
125 Hz	-0.1	0.0	0.0			
250 Hz	-0.1	0.0	0.0			
500 Hz	0.0	0.0	0.0			
1000 Hz	0.0	0.0	0.0			
2000 Hz	0.0	0.1	0.0			
4000 Hz	0.0	0.0	0.0			
8000 Hz	0.1	0.1	0.0			
16000 Hz	-1.3	-1.4	0.0		+5.0 -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD FAST / 30-130	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
UUC Weighting	(dB)	(dB)	(dB)	0.20	0.20	Pass
A	114.00	114.0	0.0			
C	114.00	114.0	0.0			
Z	114.00	114.0	0.0			

UUC Setting	STD 30-130 / A	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
UUC Time Response	(dB)	(dB)	(dB)	0.20	0.10	Pass
Fast	114.00	114.0	0.0			
Slow	114.00	114.0	0.0			
Leq	114.00	114.0	0.0			

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.04 Issue date: 5/6/24

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Certificate No : 25-SLM-057
Request No : Req-2025-0401

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	UUC (dB)			
STD Setting	(dB)	0.10	0.30	Pass
Initial	114.0			
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated REF (dB)	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC (dB)	ERR (dB)			
FAST / A / 30-130	(dB)	(dB)	(dB)	0.30	1.1	Pass
138.00	138	137.9	-0.1			
134.00	134	134.0	0.0			
129.00	129	128.9	-0.1			
124.00	124	124.0	0.0			
119.00	119	119.0	0.0			
114.00	114	114.0	0.0			
109.00	109	109.0	0.0			
104.00	104	104.0	0.0			
99.00	99	99.0	0.0			
94.00	94	94.0	0.0			
89.00	89	89.0	0.0			
84.00	84	84.0	0.0			
79.00	79	79.0	0.0			
74.00	74	74.0	0.0			
69.00	69	69.0	0.0			
64.00	64	64.0	0.0			
59.00	59	59.0	0.0			
54.00	54	54.0	0.0			
49.00	49	49.0	0.0			
44.00	44	44.0	0.0			
39.00	39	39.0	0.0			
34.00	34	33.9	-0.1			
29.00	29	28.9	-0.1			
24.00	24	23.9	-0.1			

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FM-708-SLM-01 Rev.04 Issue date: 5/6/24

เอกสารไม่ควบคุม

Certificate No : 25-SLM-057
Request No : Req-2025-0401

9. Level linearity including the level range control

UUC Setting	STD FAST / A	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
UUC Range	(dB)	(dB)	(dB)	0.30	1.1	Pass
30-130	29.50	29.6	0.1			
	114	114.0	0.0			

10. Tone burst response

UUC Setting	STD A / 30-130	Anticipated Toneburst	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
			Ref	ERR			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.20	1.0	Pass
Fast	200	126.0	126.0	0.0			
	2	109.0	109.0	0.0			
	0.25	100.0	99.9	-0.1			
Slow	200	119.6	119.6	0.0			
	2	100.0	100.0	0.0			
	200	120.0	120.0	0.0			
SEL	2	100.0	100.0	0.0			
	0.25	91.0	90.9	-0.1			

11. Peak C Sound level

UUC Setting	Anticipated FAST / C / 55-141	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF	ERR			
STD Setting	(dB)	(dB)	(dB)	0.20	3.0	Pass
Complete cycle	136.4	136.4	0.00			
Positive half cycle	135.4	135.2	-0.20			
Negative half cycle	135.4	135.2	-0.20			

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FM-708-SLM-01 Rev.04 Issue date: 5/6/24

เอกสารไม่ควบคุม

Certificate No : 25-SLM-057
Request No : Req-2025-0401

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	UUC (dB)			
STD Setting	(dB)	0.20	1.5	Pass
Positive one-half cycle	139.5			
Negative one-half cycle	139.3			
Deviated	0.2			

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	UUC (dB)			
STD Setting	(dB)	0.10	0.30	Pass
Initial	129.0			
Final	129.0			
Deviated	0.0			

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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.04 Issue date: 5/6/24

เอกสารไม่ควบคุม

Certificate No : 25-SLM-057
Request No : Req-2025-0401

Decision Rule for Statements of Conformity

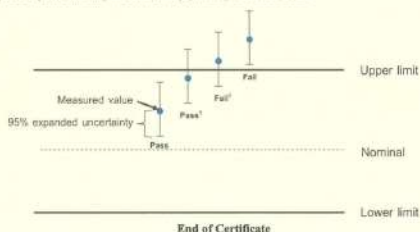
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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.

FSM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

40/1-49/1 Sirinthorn Road, Bangbunru, Bangplad, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com

Cert. No. : ACL25033
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01010784 / 194539 / 14662
ID No.: UAE.EFM.087/2565

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 03 JANUARY 2025
Calibration Date : 13 - 14 JANUARY 2025
Date of Issue : 15 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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

เอกสารไม่ควบคุม

Cert. No. : ACL25033
Job No. : VC68AC0056
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

เอกสารไม่ควบคุม

Cert. No. : ACL25033
Job No. : VC68AC0056
Pages : 3 of 8

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

Cert. No. : ACL25033
Job No. : VC68AC0056
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	16.7
Flat	22.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-0.1	-0.1	-0.1	±5.0

Cert. No. : ACL25033
Job No. : VC68AC0056
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.2

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เอกสารไม่ควบคุม

Cert. No. : ACL25033
Job No. : VC68AC0056
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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Cert. No. : ACL25033
Job No. : VC68AC0056
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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Cert. No. : ACL25033
Job No. : VC68AC0056
Pages : 8 of 8Cert. No. : ACL25030
Pages : 1 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.1	-0.1	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

เอกสารไม่ควบคุม

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00709670 / 188531 / 01221
ID No.: UAE.EFM.022/2564

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 03 JANUARY 2025
Calibration Date : 13 - 14 JANUARY 2025
Date of Issue : 15 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Thanakul Petchurai)

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

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 3 of 8

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Page : 4 of 8**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise**2.1 Normal test**

Measured Value (dB)
15.6

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

Frequency Weighting	Weighting (dB)
A - weight	12.6
C - weight	18.7
Flat	24.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.4	0.4	0.4	± 1.0
8000	3.1	3.2	3.2	±5.0

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 5 of 8**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.1	0.0	0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.1	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz**5.1 Frequency weightings at 1 kHz**

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 6 of 8**7. Level linearity on the reference level range**

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 7 of 8**8. Level linearity including the level range control**

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

เอกสารไม่ควบคุม

Cert. No. : ACL25030
Job No. : VC68AC0056
Pages : 8 of 8Cert. No. : ACL25031
Pages : 1 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม
Z. KetchurCert. No. : ACL25031
Job No. : VC68AC0056
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

- 3.1 National Institute of Metrology (Thailand).
3.2 Thailand Institute of Scientific and Technological Research (TISTR).

เอกสารไม่ควบคุม
Z. Ketchur

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00709682 / 187256 / 01233
ID No.: UAE.EFM.023/2564

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 03 JANUARY 2025
Calibration Date : 13 - 14 JANUARY 2025
Date of Issue : 15 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Ketchur
(Thanakul Petchurai)

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

เอกสารไม่ควบคุม
Z. KetchurCert. No. : ACL25031
Job No. : VC68AC0056
Pages : 3 of 8

Summary of Measurement Result :

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

เอกสารไม่ควบคุม
Z. Ketchur

Cert. No. : ACL25031
Job No. : VC68AC0056
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	17.2
Flat	23.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	2.1	2.2	2.2	±5.0

Cert. No. : ACL25031
Job No. : VC68AC0056
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz:

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.1	±2.0
125	0.1	0.1	0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz:

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Cert. No. : ACL25031
Job No. : VC68AC0056
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

เอกสารไม่ควบคุม

Cert. No. : ACL25031
Job No. : VC68AC0056
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

เอกสารไม่ควบคุม

10. Peak C sound level

Cert. No. : ACL25031
Job No. : VC68AC0056
Pages : 8 of 8

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม

Cert. No. : ACL25114
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00409109 / 189688 / 90554
ID No. : UAE.EFM.013/2564

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 JANUARY 2025
Calibration Date : 28 JANUARY 2025
Date of Issue : 30 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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

เอกสารไม่ควบคุม

Cert. No. : ACL25113
Job No. : VC68AC0061
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand),

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

Cert. No. : ACL25113
Job No. : VC68AC0061
Pages : 3 of 8

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Cert. No. : ACL25113
Job No. : VC68AC0061
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	17.3
Flat	23.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.3	0.3	0.3	± 1.0
8000	2.3	2.3	2.3	±5.0

Cert. No. : ACL25113
Job No. : VC68AC0061
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

เอกสารไม่ควบคุม

S. Petch

เอกสารไม่ควบคุม

S. Petch

Cert. No. : ACL25113
Job No. : VC68AC0061
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.2	0.2	± 1.1
25.0	25.2	0.2	± 1.1

เอกสารไม่ควบคุม

S. Petch

Cert. No. : ACL25113
Job No. : VC68AC0061
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

เอกสารไม่ควบคุม

S. Petch

Cert. No. : ACL25113
Job No. : VC68AC0061
Pages : 8 of 8Cert. No. : ACL25020
Pages : 1 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

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

12. High level stability

Frequency	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Weighting				
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม
T. Petchuraj

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00408979 / 156122 / 90424
ID No.: UAE.EFM.006/2564

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 03 JANUARY 2025
Calibration Date : 13 - 14 JANUARY 2025
Date of Issue : 15 JANUARY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchuraj
(Thanakul Petchuraj)

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

เอกสารไม่ควบคุม

Cert. No. : ACL25020
Job No. : VC68AC0056
Pages : 2 of 8Cert. No. : ACL25020
Job No. : VC68AC0056
Pages : 3 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference
Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

- 3.1 National Institute of Metrology (Thailand).
3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Summary of Measurement Result :

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

เอกสารไม่ควบคุม
T. Petchurajเอกสารไม่ควบคุม
T. Petchuraj

Cert. No. : ACL25020
Job No. : VC68AC0056
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	17.9
Flat	23.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-0.3	-0.3	-0.3	±5.0

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Job No. : VC68AC0056
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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เอกสารไม่ควบคุม

Cert. No. : ACL25020
Job No. : VC68AC0056
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

เอกสารไม่ควบคุม

Cert. No. : ACL25020
Job No. : VC68AC0056
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

เอกสารไม่ควบคุม

Cert. No. : ACL25020
Job No. : VC68AC0056
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

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

Certificate No : 25-ACT-071

Request No : Req-2025-1015

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 35A
Serial Number : 73249
ID : UAE.EFM.105/2561

Class : 1

Range : 94 , 114 dB / 1000 Hz

Instrument Status : Used

Calibration Environment and Details


Temperature : (23 ±2 °C)
Humidity : (50 ±20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 9 May 2025
Calibration Date : 20 May 2025
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	EEL	12 June 2025
THD Multimeter	2015	1047765	NIMT	4 February 2026

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

Note:

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

Calibrated By : 
Mr. Noppadon Luangart
Service Calibration EngineerApproved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 20 May 2025

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

FM-708-ACT-02 Rev.04 Issue date 17/2/25

Certificate No : 25-ACT-071

Request No : Req-2025-1015

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)
	Measured	Deviated value	Measured	Deviated value	
94 dB / 1000 Hz	93.82	-0.18	-	-	0.11
114 dB / 1000 Hz	113.81	-0.19	-	-	0.11

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value	
94 dB / 1000 Hz	1000.0	0.00	-	-	0.01
114 dB / 1000 Hz	1000.0	0.00	-	-	0.010

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (%)	Deviated value	Measured (%)	Deviated value	
94 dB / 1000 Hz	2.11	-	-	-	0.17
114 dB / 1000 Hz	0.46	-	-	-	0.17

Note :

- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

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

FM-708-ACT-02 Rev.04 Issue date 17/2/25

Certificate of Calibration

Customer

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

Certificate No : 25-NDM-066

Request No : Req-2025-0468

Unit Under Calibration Details

Measurement item : Noise Dosimeter
Manufacturer : SVANTEK
Model : SV 104IS
Serial Number : 128372
ID : UAE.EFM.082/2566
Resolution : 0.1 dB

Microphone Class : 2

Microphone Model : SV 27IS

Microphone S/N : 133718

Preamplifier Model : -

Preamplifier S/N : -

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 : 19 February 2025
Calibrated Date : 17 March 2025
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Brüel&Kjaer	4192	2294985	25 June 2025	NIMT
Audio Generator	SvanteK	SVAN 401	131	15 October 2025	WK Electric
Timer	EXTech	-	05-ACT	11 March 2026	TPA

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Service Calibration EngineerApproved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 17 March 2025

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-NDM-01 Rev.05 Issue date 2/8/24

Certificate No : 25-NDM-066

Request No : Req-2025-0468

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
1000 Hz 114 dB	120	120	5.37	3.36	-0.5	3.1	-21, +26	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35, SN. 44792

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerances	Result
FAST / 60-140	A	C	(± dB)	Limit	
STD Setting	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	0.5	0.9	0.40	2.0	Pass
125 Hz	0.5	0.8	0.40	1.5	Pass
250 Hz	0.2	0.4	0.40	1.5	Pass
500 Hz	0.2	0.4	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	-	-
2000 Hz	-0.1	0.0	0.40	2.0	Pass
4000 Hz	-0.1	0.0	0.40	3.0	Pass
8000 Hz	2.6	2.9	0.40	5.0	Pass

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เอกสารไม่ควบคุม

ISM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-066

Request No : Req-2025-0468

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High													
1000 Hz	Ref	(dB)	60.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0			
Level A	(dB)	59.9	80.2	90.2	100.1	110.1	114.0	120.0	130.0	140.0				
Error	(dB)	-0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0				
8000 Hz	Ref	(dB)			88.9	98.9	108.9	112.9	118.9	128.9	138.9			
Level A	(dB)				89.0	98.9	108.9	112.9	118.9	128.8	138.8			
Error	(dB)				0.1	0.0	0.0	0.0	0.0	-0.1	-0.1			
63 Hz	Ref	(dB)							87.8	93.8	103.8	113.8		
Level A	(dB)								87.8	93.8	103.8	113.8		
Error	(dB)								0.0	0.0	0.0	0.0		
Tolerances Limit	(±dB)								1.0					
UNCERTAINTY	(±dB)								0.3					
Result									Pass					

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
1000 Hz 110 dB	27	27	0.30	0.30	0.00	5.6	-21, +26	Pass
1000 Hz 110 dB	45	45	0.50	0.51	+2.00			Pass
1000 Hz 110 dB	90	90	1.00	1.01	+1.00			Pass
1000 Hz 110 dB	180	180	2.00	2.02	+1.00			Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75			Pass
1000 Hz 120 dB	72	72	8.00	8.05	+0.63			Pass
1000 Hz 120 dB	90	90	10.00	9.90	-1.00	5.6		Pass
1000 Hz 120 dB	180	180	20.00	20.22	+1.10			Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85			Pass
1000 Hz 120 dB	720	720	80.00	80.49	+0.61			Pass

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ISM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-066

Request No : Req-2025-0468

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	
4000 Hz 95 dB	2846	2846	1.00	1.00	0.00	0.052	-0.29, +0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB	2846	2846	1.00	1.00	0.00	5.6	-21, +26	Pass
Burst 1 ms, 100 dB	900	900	1.00	1.00	0.00		-29, +41	Pass
Burst 1 ms, 108 dB	143	143	1.00	1.01	+1.00		-29, +41	Pass

5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement		UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	UUC		UUC	Different		Limit	
Calibrator Setting	(s)		(Pa ² ·h)	(%)	(%)	(%)	
Continuous Rectangle +	29		10.37	0.00	3.7	-21, +26	Pass
Continuous Rectangle -			10.37				Pass

* Indicates non accredited

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เอกสารไม่ควบคุม

ISM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-066

Request No : Req-2025-0468

Decision Rule for Statements of Conformity

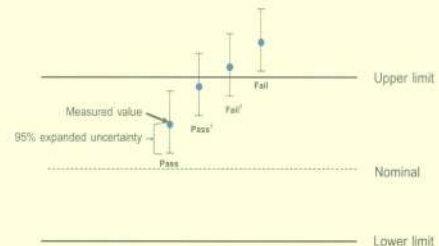
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09-2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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

เอกสารไม่ควบคุม

ISM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-NDM-046
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2025-0403

Unit Under Calibration Details

Measurement item : Noise Dosimeter Microphone Class : 2
Manufacturer : SVANTEK Microphone Model : SV 27IS
Model : SV 104IS Microphone S/N : 132945
Serial Number : 128431 Preamplifier Model : -
ID : UAE.EFM.083/2566 Preamplifier S/N : -
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 : 13 February 2025
Calibrated Date : 5 March 2025
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	Bruel&Kjaer	4192	2294985	25 June 2025	NIMT
Audio Generator	SvanteK	SVAN 401	131	9 October 2024	WK Electric
Timer	EXTECH	-	05-ACT	14 March 2025	TPA

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
Service Calibration Engineer

Approved By : 
Mr. Paitir Marhavorn
Calibration Engineer Supervisor
Issue Date : 5 March 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of **เอกสารไม่ควบคุม**
PIM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-046
Request No : Req-2025-0403

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
1000 Hz 114 dB	120	120	3.17	3.13	-1.3	3.1	-21, +26	Pass

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

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerances	Result
FAST / 60-140	A	C	(± dB)	Limit	
STD Setting	(dB)	(dB)	(± dB)	(± dB)	
*63 Hz	0.2	0.3	0.40	2.0	Pass
125 Hz	0.2	0.3	0.40	1.5	Pass
250 Hz	0.1	0.1	0.40	1.5	Pass
500 Hz	0.0	0.1	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	-	-
2000 Hz	0.4	0.4	0.40	2.0	Pass
4000 Hz	1.5	1.4	0.40	3.0	Pass
8000 Hz	3.6	3.7	0.40	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of **เอกสารไม่ควบคุม**
PIM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-046
Request No : Req-2025-0403

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High										
1000 Hz	Ref	(dB)	80.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0
	Level A	(dB)	80.1	80.2	90.1	100.0	110.0	114.0	120.0	130.0	140.0
	Error	(dB)	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
8000 Hz	Ref	(dB)	88.9	88.9	98.9	108.9	112.9	118.9	128.9	138.9	
	Level A	(dB)	89.0	88.9	98.8	108.8	112.9	118.9	128.9	138.8	
	Error	(dB)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	
63 Hz	Ref	(dB)					87.8	93.8	103.8	113.8	
	Level A	(dB)					87.8	93.8	103.8	113.8	
	Error	(dB)					0.0	0.0	0.0	0.0	
Tolerances Limit		(±dB)	1.0								
UNCERTAINTY		(±dB)	0.3								
Result			Pass								

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
1000 Hz 110 dB	27	27	0.30	0.30	0.00	5.6	-21, +26	Pass
1000 Hz 110 dB	45	45	0.50	0.51	+2.00			Pass
1000 Hz 110 dB	90	90	1.00	1.01	+1.00			Pass
1000 Hz 110 dB	180	180	2.00	2.02	+1.00			Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75			Pass
1000 Hz 120 dB	72	72	8.00	8.08	+0.63	5.6	-21, +26	Pass
1000 Hz 120 dB	90	90	10.00	10.13	+1.30			Pass
1000 Hz 120 dB	180	180	20.00	20.22	+1.10			Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85			Pass
1000 Hz 120 dB	720	720	80.00	80.49	+0.61			Pass

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PIM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-046
Request No : Req-2025-0403

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	
4000 Hz 95 dB	2846	2846	1.00	1.00	0.00	0.052	-0.29 ~ +0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB	2846	2846	1.00	1.00	0.00	5.6	-21 ~ +26	Pass
Burst 1 ms, 100 dB	900	900	1.00	1.00	0.00		-29 ~ +41	Pass
Burst 1 ms, 108 dB	143	143	1.00	1.01	+1.00		-29 ~ +41	Pass

5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Different	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
Continuous Rectangle +	29		10.37		0.00	3.7	-21 ~ +26	Pass
Continuous Rectangle -			10.37					Pass

* Indicates non accredited

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PIM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-046
Request No : Req-2025-0403

Decision Rule for Statements of Conformity

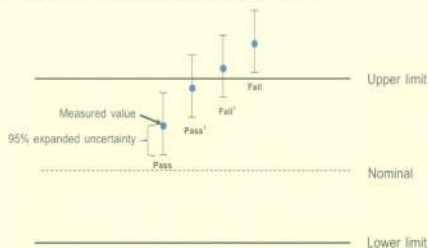
The standard deviation rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019. Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Customer

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

Certificate No : 25-NDM-063
Request No : Req-2025-0465

Unit Under Calibration Details

Measurement item : Noise Dosimeter
Manufacturer : SVANTEK
Model : SV 104IS
Serial Number : 128474
ID : UAE-EFM.086/2.566
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : SV 27IS
Microphone S/N : 133728
Preamplifier Model : -
Preamplifier S/N : -
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 : 19 February 2025
Calibrated Date : 17 March 2025
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Briel&Kjaer	4192	2294983	25 June 2025	NIMT
Audio Generator	SvanteK	SVAN 401	131	15 October 2025	WK Electric
Timer	EXTECH	-	05-ACT	11 March 2026	TPA

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 Luangrat
Service Calibration Engineer

Approved By : 
Mr. Paeit Mathavom
Calibration Engineer Supervisor
Issue Date : 17 March 2025

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PM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-063
Request No : Req-2025-0465

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error			
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)			
1000 Hz 114 dB	120	120	3.37	3.36	-0.3	3.1	-21, +26	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35, SN. 44792

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY (± dB)	Tolerances Limit (± dB)	Result
FAST / 60-140	A	C			
STD Setting	(dB)	(dB)			
*63 Hz	0.2	0.1	0.40	2.0	Pass
125 Hz	-0.1	0.0	0.40	1.5	Pass
250 Hz	-0.1	0.0	0.40	1.5	Pass
500 Hz	0.0	0.1	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	-	-
2000 Hz	0.1	0.2	0.40	2.0	Pass
4000 Hz	-0.9	-0.9	0.40	3.0	Pass
8000 Hz	1.3	1.9	0.40	5.0	Pass

Certificate No : 25-NDM-063
Request No : Req-2025-0465

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High														
1000 Hz	Ref	(dB)	60.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0				
	Level A	(dB)	60.0	80.1	90.1	100.0	110.0	114.0	119.9	129.9	139.9				
	Error	(dB)	0.0	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1				
8000 Hz	Ref	(dB)				88.9	98.9	108.9	112.9	118.9	128.9	138.9			
	Level A	(dB)				89.0	98.9	108.9	112.9	118.9	128.9	138.8			
	Error	(dB)				0.1	0.0	0.0	0.0	0.0	0.0	-0.1			
63 Hz	Ref	(dB)							87.8	93.8	103.8	113.8			
	Level A	(dB)							87.8	93.8	103.8	113.8			
	Error	(dB)							0.0	0.0	0.0	0.0			
Tolerances Limit		(±dB)	1.0												
UNCERTAINTY		(±dB)	0.3												
Result			Pass												

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error			
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)			
1000 Hz 110 dB	27	27	0.30	0.30	0.00	5.6	-21, +26	Pass
1000 Hz 110 dB	45	45	0.50	0.50	0.00			Pass
1000 Hz 110 dB	90	90	1.00	0.99	-1.00			Pass
1000 Hz 110 dB	180	180	2.00	1.98	-1.00			Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75			Pass
1000 Hz 120 dB	72	72	8.00	8.05	+0.63	5.6	-21, +26	Pass
1000 Hz 120 dB	90	90	10.00	10.13	+1.30			Pass
1000 Hz 120 dB	180	180	20.00	20.22	+1.10			Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85			Pass
1000 Hz 120 dB	720	720	80.00	80.49	+0.61			Pass

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PM-708-NDM-01 Rev.05 Issue date 2/9/24

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.

เอกสารไม่ควบคุม

PM-708-NDM-01 Rev.05 Issue date 2/9/24

Certificate No : 25-NDM-063
Request No : Req-2025-0465

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error			
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	
4000 Hz 95 dB	2846	2846	1.00	0.98	-0.02	0.052	-0.29 ~ +0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 60-140	Ref	UUC	Ref	UUC	Error			
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB	2846	2846	1.00	0.98	-2.00	5.6	-21 ~ +26	Pass
Burst 1 ms, 100 dB	900	900	1.00	0.98	-2.00		-29 ~ +41	Pass
Burst 1 ms, 108 dB	143	143	1.00	0.99	-1.00		-29 ~ +41	Pass

5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement		UNCERTAINTY	Tolerances Limit	Result
FAST / A / 60-140	UUC		UUC	Different			
Calibrator Setting	(s)		(Pa ² h)	(%)	(%)	(%)	
Continuous Rectangle +	29		10.37	0.00	3.7	-21 ~ +26	Pass
Continuous Rectangle -			10.37				Pass

* Indicates non accredited

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-NDM-01 Rev.03 Issue date 2/9/24

Certificate No : 25-NDM-063
Request No : Req-2025-0465

Decision Rule for Statements of Conformity

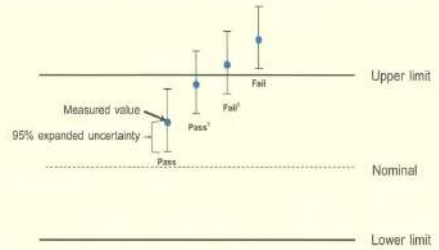
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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-NDM-01 Rev.03 Issue date 2/9/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 24-NDM-180
Address : 81 Soi Sudomuek 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2024-1547

Unit Under Calibration Details

Measurement item : Noise Dosimeter Microphone Class : 2
Manufacturer : SVANTEK Microphone Model : SY27
Model : SV 104 Microphone S/N : 132120
Serial Number : 143226 Preamplifier Model : -
ID : UAEFFM1442566 Preamplifier S/N : -
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 : 9 July 2024
Calibrated Date : 16 July 2024
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	EFA000254	25 July 2024	TISI
Standard Microphone	GRAS	40AN	188273	21 August 2024	GRAS
Sine Generator	Svanteck	Svan401	131	9 October 2024	WK Electric
Timer	EXTech	-	05-ACT	14 March 2025	TPA

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. Nopadon Luangrat
Service Calibration Engineer

Approved By : 
Mr. Paitit Mathavorn
Calibration Engineer Supervisor
Issue Date : 16 July 2024

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-NDM-01 Rev.04 Issue date 5/9/24

Certificate No : 24-NDM-180
Request No : Req-2024-1547

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error			
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)	
1000 Hz 114 dB	120	120	3.17	3.13	-1.3	3.1	-21, +26	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 59079

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY (± dB)	Tolerances Limit (± dB)	Result
FAST / 55-140	A	C			
STD Setting	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	-0.3	-0.1	0.40	2.0	Pass
125 Hz	-0.3	-0.2	0.40	1.5	Pass
250 Hz	-0.6	-0.5	0.40	1.5	Pass
500 Hz	-0.4	-0.3	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	-	-
2000 Hz	0.2	0.2	0.40	2.0	Pass
4000 Hz	1.8	1.8	0.40	3.0	Pass
8000 Hz	-0.2	0.0	0.40	5.0	Pass

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-NDM-01 Rev.04 Issue date 5/9/24

Certificate No : 24-NDM-180
Request No : Req-2024-1547

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High										
1000 Hz	Ref	(dB)	55.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0	
	Level A	(dB)	54.7	80.1	90.1	100.0	110.0	114.0	119.9	129.9	139.9	
	Error	(dB)	-0.3	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	
8000 Hz	Ref	(dB)			88.9	98.9	108.9	112.9	118.9	128.9	138.9	
	Level A	(dB)			88.9	98.9	108.9	112.9	118.9	128.9	138.9	
	Error	(dB)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
63 Hz	Ref	(dB)						87.8	93.8	103.8	113.8	
	Level A	(dB)						87.8	93.8	103.8	113.8	
	Error	(dB)						0.0	0.0	0.0	0.0	
Tolerances Limit		(±dB)	1.0									
UNCERTAINTY		(±dB)	0.3									
Result			Pass									

b. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 55-140		Ref	UUC	Ref	UUC	Error			
Calibrator Setting		(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
1000 Hz 110 dB		27	27	0.30	0.30	-0.00	5.6	-21, +26	Pass
1000 Hz 110 dB		45	45	0.50	0.51	+2.00			Pass
1000 Hz 110 dB		90	90	1.00	1.01	+1.00			Pass
1000 Hz 110 dB		180	180	2.00	2.02	+1.00			Pass
1000 Hz 120 dB		36	36	4.00	4.03	+0.75			Pass
1000 Hz 120 dB		72	72	8.00	8.05	+0.63	5.6	-21, +26	Pass
1000 Hz 120 dB		90	90	10.00	9.90	-1.00			Pass
1000 Hz 120 dB		180	180	20.00	19.76	-1.20			Pass
1000 Hz 120 dB		360	360	40.00	40.34	+0.85			Pass
1000 Hz 120 dB		720	720	80.00	80.49	+0.61			Pass

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FM-706-NDM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-NDM-180
Request No : Req-2024-1547

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 55-140		Ref	UUC	Ref	UUC	Error			
Calibrator Setting		(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	(Pa ² ·h)	
4000 Hz 95 dB		2846	2846	1.00	1.00	0.00	0.052	-0.29 ~ +0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 55-140		Ref	UUC	Ref	UUC	Error			
Calibrator Setting		(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB		2846	2846	1.00	1.00	0.00	5.6	-21 ~ +26	Pass
Burst 1 ms, 100 dB		900	900	1.00	1.00	0.00			Pass
Burst 1 ms, 108 dB		143	143	1.00	1.01	+1.00			Pass

5. Response to unipolar pulse

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit	Result
FAST / A / 55-140		Ref	UUC	Ref	UUC	Different			
Calibrator Setting		(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
Continuous Rectangle *		29		10.37		0.00	3.7	-21 ~ +26	Pass
Continuous Rectangle *				10.37					Pass

* Indicates non accredited

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FM-706-NDM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-NDM-180
Request No : Req-2024-1547

Decision Rule for Statements of Conformity

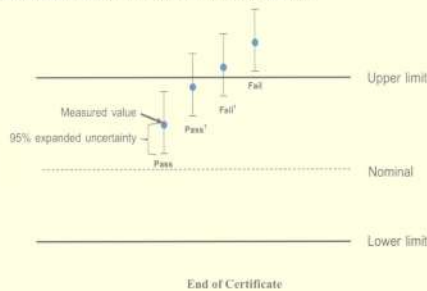
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass¹ = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass² = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail² = The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.



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

เอกสารไม่ควบคุม

FM-706-NDM-01 Rev.04 Issue date 5/6/24

Certificate of Calibration

Customer		Certificate No : 25-TPM-050	
Name		Request No : Req-2024-2855	
Address		Page : 1/2	
UNIT UNDER CALIBRATION DETAILS			
Calibration Parameter			
Instrument Name		Range Calibration : 20 °C to 60 °C	
Manufacturer		Type of Sensor : RTD	
Model		Sensor Diameter (mm) : 4.5	
Serial Number		Calibration Position (mm) : 67.5	
Resolution		Instrument Status : Used	
ID Number			
CALIBRATION ENVIRONMENT AND DETAILS			
Temperature			
Humidity			
Received Date			
Calibrated Date			
Calibration Procedure			
REFERENCE STANDARD			
Traceability			
Note			

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

Approved By :
Mr. Noppadon Luangart
Technical Manager
Issue Date : 28 January 2025

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

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FM-706-NDM-01 Rev.04 Issue date 5/6/24

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

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FM-706-TPM-01 Rev.01 Issue date 13/02/20



Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 25-TPM-050

Request No : Req-2024-2855

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	20.030	20.0	0.0	0.13
	25.032	25.0	0.0	0.13
	30.034	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.037	40.1	-0.1	0.13
	45.040	45.1	-0.1	0.13
	50.042	50.1	-0.1	0.13
DRY	60.045	60.1	-0.1	0.13
	20.032	20.2	-0.2	0.13
	25.032	25.2	-0.2	0.13
	30.036	30.2	-0.2	0.13
	35.036	35.2	-0.2	0.13
	40.038	40.2	-0.2	0.13
	45.040	45.2	-0.2	0.13
GLOBE	50.042	50.2	-0.2	0.13
	60.046	60.2	-0.2	0.13
	20.031	20.1	-0.1	0.13
	25.033	25.1	-0.1	0.13
	30.033	30.1	-0.1	0.13
	35.035	35.1	-0.1	0.13
	40.038	40.1	-0.1	0.13
	45.040	45.1	-0.1	0.13
	50.042	50.1	-0.1	0.13
	60.046	60.1	-0.1	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jirapudrasakul

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-TPM-01 Rev.01 Issue date 13/02/20

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-TPM-321

Request No : Req-2024-1555

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature

Instrument Name : Thermal Environment Monitor

Manufacturer : TSI QUEST

Model : QT-34

Serial Number : TEX040010

Resolution : 0.1 °C

ID Number : UAE.EFM.114/2566

Range Calibration : -20 °C to 60 °C

Type of Sensor : RTD

Sensor Diameter (mm) : 4.5

Calibration Position (mm) : 67.5

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 15 %RH

Received Date : 10 July 2024

Calibrated Date : 16 July 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/RTD100, SN: 08000657, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No. : Calibration 0292

Note

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

Approved By :

Mr. Noppadon Luangrat

Technical Manager

Issue Date :

16 July 2024

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-TPM-01 Rev.01 Issue date 13/02/20

เอกสารไม่ควบคุม



Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 24-TPM-321

Request No : Req-2024-1555

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	20.032	20.0	0.0	0.13
	25.032	25.0	0.0	0.13
	30.034	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.038	40.0	0.0	0.13
	45.040	45.2	-0.2	0.13
	50.043	50.2	-0.2	0.13
DRY	60.047	60.2	-0.2	0.13
	20.031	19.9	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.034	29.9	+0.1	0.13
	35.036	34.9	+0.1	0.13
	40.039	40.0	0.0	0.13
	45.040	45.1	-0.1	0.13
GLOBE	50.042	50.1	-0.1	0.13
	60.046	60.1	-0.1	0.13
	20.031	19.8	+0.1	0.13
	25.033	24.9	+0.1	0.13
	30.035	29.9	+0.1	0.13
	35.037	34.9	+0.1	0.13
	40.038	39.9	+0.1	0.13
	45.039	45.0	0.0	0.13
	50.042	50.0	0.0	0.13
	60.047	60.0	0.0	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jirapudrasakul

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-TPM-01 Rev.01 Issue date 13/02/20

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-TPM-323

Request No : Req-2024-1556

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature

Instrument Name : Thermal Environment Monitor

Manufacturer : TSI QUEST

Model : QT-34

Serial Number : TEX040012

Resolution : 0.1 °C

ID Number : UAE.EFM.116/2566

Range Calibration : -20 °C to 60 °C

Type of Sensor : RTD

Sensor Diameter (mm) : 4.5

Calibration Position (mm) : 67.5

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 15 %RH

Received Date : 10 July 2024

Calibrated Date : 16 July 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/RTD100, SN: 08000657, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No. : Calibration 0292

Note

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

Approved By :

Mr. Noppadon Luangrat

Technical Manager

Issue Date :

16 July 2024

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-TPM-01 Rev.01 Issue date 13/02/20

เอกสารไม่ควบคุม



Calibration Note
UUC Adjustment : Not Adjust
Certificate No : 34-TPM-127
Request No : Req-2024-1556
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.032	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.033	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.038	39.9	-0.1	0.13
	45.040	45.0	0.0	0.13
	50.043	50.1	0.1	0.13
	60.047	60.1	0.1	0.13
DRY	20.031	20.1	0.1	0.13
	25.034	25.1	0.1	0.13
	30.035	30.1	0.1	0.13
	35.036	35.1	0.1	0.13
	40.039	40.0	0.0	0.13
	45.040	45.1	0.1	0.13
	50.042	50.2	0.2	0.13
	60.046	60.2	0.2	0.13
GLOBE	20.031	20.1	0.1	0.13
	25.031	25.1	0.1	0.13
	30.035	30.1	0.1	0.13
	35.037	35.1	0.1	0.13
	40.038	40.1	0.1	0.13
	45.039	45.1	0.1	0.13
	50.042	50.2	0.2	0.13
	60.047	60.2	0.2	0.13

End of Certificate

Calibrated By :
Mr. Sittichok Jirapichitsakul

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FM-708-TPM-01 Rev.01 Issue date 13/02/21

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Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260
Certificate No : 34-TPM-315
Request No : Req-2024-1482
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : TSI QUEST
Model : QT-34
Serial Number : TEX040016
Resolution : 0.1 °C
ID Number : UAE.EFM.120/2566
Range Calibration : 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 3 July 2024
Calibrated Date : 9 July 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/INGGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM
Which was calibrated on 1 March 2024, Calibration Certificate No : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By :
Mr. Noppadon Luangart
Technical Manager
10 July 2024
Issue Date :

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FM-708-TPM-01 Rev.01 Issue date 13/02/20

เอกสารไม่ควบคุม



Calibration Note
UUC Adjustment : Not Adjust
Certificate No : 24-TPM-315
Request No : Req-2024-1402
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.032	19.9	-0.1	0.13
	25.032	25.0	0.0	0.13
	30.031	30.1	0.1	0.13
	35.037	35.0	0.0	0.13
	40.040	40.0	0.0	0.13
	45.038	45.1	0.1	0.13
	50.042	50.1	0.1	0.13
	60.045	60.0	0.0	0.13
DRY	20.033	20.0	0.0	0.13
	25.030	25.1	0.1	0.13
	30.033	30.1	0.1	0.13
	35.034	35.1	0.1	0.13
	40.039	40.2	0.2	0.13
	45.038	45.2	0.2	0.13
	50.042	50.2	0.2	0.13
	60.046	60.2	0.2	0.13
GLOBE	20.033	19.9	-0.1	0.13
	25.030	25.0	0.0	0.13
	30.033	30.1	0.1	0.13
	35.035	35.1	0.1	0.13
	40.038	40.2	0.2	0.13
	45.041	45.3	0.3	0.13
	50.040	50.2	0.2	0.13
	60.045	60.3	0.3	0.13

End of Certificate

Calibrated By :
Mr. Sittichok Jirapichitsakul

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-TPM-01 Rev.01 Issue date 13/02/20

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Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260
Certificate No : 25-AFM-013
Request No : Req-2024-2865

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : TSI
Model : 4146
Serial Number : 41461922008
ID : UAE.EFM.224/2462
Location of Calibration : LAB 4 AIR VELOCITY METER
Accuracy : 2% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 20 December 2024
Calibration Date : 15 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/051882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

Calibration By :
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :
Mr. Pichit Mathavorn
Calibration Engineer Supervisor
Issue Date : 15 January 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.04 Issue date 17/6/24

เอกสารไม่ควบคุม

Certificate No : 25-AFM-013

Request No : Req-2024-2865

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)	MPE (l/min)	Result
22.00	101.49	0.021	0.020	-0.001	0.0013	0.005	N/A
22.00	101.48	0.050	0.050	0.000	0.0033	0.005	N/A
22.00	101.49	0.100	0.100	0.000	0.0028	0.005	N/A
22.00	101.49	0.199	0.200	0.00	0.0056	0.005	N/A
22.00	101.50	0.501	0.500	0.0	0.0073	0.010	N/A
22.10	101.51	1.004	1.000	0.0	0.015	0.020	N/A
22.50	101.52	1.712	1.700	0.0	0.025	0.034	N/A
22.60	101.53	2.021	2.000	0.0	0.029	0.040	N/A
22.70	101.89	3.034	3.000	-0.03	0.044	0.060	N/A
22.80	102.00	4.032	4.000	-0.03	0.059	0.080	N/A
23.10	102.15	5.071	5.000	-0.07	0.073	0.100	N/A

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : 21.1 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

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-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 25-AFM-013

Request No : Req-2024-2865

Decision Rule for Statements of Conformity

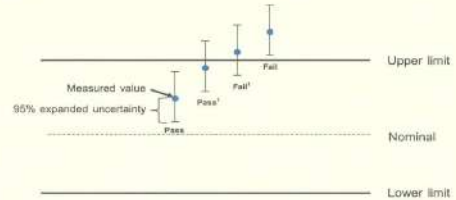
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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-AFM-01 Rev.04 Issue date 17/6/24



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No. : 25P1359
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model : 111MS

Serial No.: -

ID No.: UAE.EMA2.067/2552

Condition As-Received: Used Item

Received Date: 10 April 2025

Calibration Date: 17 April 2025

Reference: 2504-0315WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1009 mbar

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

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

Condition of this result of calibration

1.Reference standards list:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0133-24	15 May 2025

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Kaerpon Saivichai
Issue Date : 21 April 2025

Approved Signatory : Attapol P.
[] Phalinee Prabpalai
[] Sura Suwannasri
[✓] Attapol Panurach

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

Range: 720 mmHg to 780 mmHg
Scale Interval: 1 mmHg (The Fifth Estimate)

Applied Pressure (mmHg)	717.92	728.95	739.74	750.28	761.55	773.52	784.47
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	2.08	1.05	0.26	-0.28	-1.55	-3.52	-4.47

Decreasing Pressure

Applied Pressure (mmHg)	784.47	773.53	761.51	750.35	739.81	729.05	718.10
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-4.47	-3.53	-1.51	-0.35	0.19	0.95	1.90

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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Cert.No.: 25P1359
Page: 2 of 2

เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 25P1359
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: 111MS

Serial No.: -

ID No.: UAE.EMA2.067/2552

Condition As-Received: Used Item

Received Date: 10 April 2025

Calibration Date: 17 April 2025

Reference: 2504-0315WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1009 mbar

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

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using "DKD-R 6-1 : Calibration of Pressure Gauges" 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-0133-24	15 May 2025

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Kaekpon Saivichai
Issue Date: 21 April 2025

Approved Signatory: Athapol P.
[] Phalinee Prabpalai
[] Sura Suwannasri
[✓] Attapol Panurach

เอกสารไม่ควบคุม



Cert.No.: 25P1359
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 720 mmHg to 780 mmHg

Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	717.92	728.95	739.74	750.28	761.55	773.52	784.47
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	2.08	1.05	0.26	-0.28	-1.55	-3.52	-4.47

Decreasing Pressure

Applied Pressure (mmHg)	784.47	773.53	761.51	750.35	739.81	729.05	718.10
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-4.47	-3.53	-1.51	-0.35	0.19	0.95	1.90

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No.: 24H1487
Page: 1 of 2

Equipment: Digital Thermo-Hygrometer

Manufacturer: Digicon

Model: TH-02A

Serial No.: 435031148

ID No.: UAE.EFM.006/2567

Condition As-Received: New Item

Received Date: 10 July 2024

Calibration Date: 15 July 2024

to 17 July 2024

Reference: 2407-0383WSC

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

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 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	21819	25 Sep 2024
2) Handheld Thermometer With Sensor	1523	5717095	231321	08 Nov 2024

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

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

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

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

Calibrated by: Sursit Phansudnoi
Issue Date: 17 July 2024

Approved Signatory: Viporn
[] Chakrit Waewwanjua
[✓] Viporn Tantiyawutti
[] Unnophol Harachai

เอกสารไม่ควบคุม



Cert. No.: 24H1487
Page: 2 of 2

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

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	39	-1.1	1.4
25.0	50.1	48	-2.1	1.6
25.0	60.0	58	-2.0	1.6
25.0	70.2	68	-2.2	1.6

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

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.3	0.286	0.42
24.984	25.2	0.216	0.42
30.050	30.1	0.050	0.42
40.027	40.0	-0.027	0.42

UUC* : Unit Under Calibration

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

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เอกสารไม่ควบคุม



Cert.No.: 24CH1379
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.:240710SIA605377	4.008	4.01	173	0.0079	2.00
	6.999	7.00	-2	0.0092	2.00
	6.999	7.00	-2	0.0095	2.00
	10.010	10.01	-178	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -
- Serial No. : 240710SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
15.0	15.003	14.9	-0.103	0.13	2.00
30.0	30.001	29.9	-0.101	0.13	2.00
45.0	45.003	44.8	-0.203	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000 FAX. 0-2719-9484

Certificate of Testing

Cert.No.: 24TW241
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE0L0004
ID No. : UAE.EFM.087/2564(EFM.DO.06/64)
Received Date : 05 November 2024
Test Date : 06 November 2024
Reference : 2411-0123WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirithean
Approved by : 
Approved Signatory
() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 9 November 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW241
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 9K0E0257

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0084

This report was certified only for the instrument we tested.It is allowable to use for study
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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24LM173
Page.: 1 of 2

Equipment : DO Meter with Sensor
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE0L0004
ID No. : UAE.EFM.087/2564(EFM.DO.06/64)
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 : 05 November 2024
Calibrated Date : 06 November 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Warakorn Lernagatrakul
Approved by : 
Approved Signatory
() Ponpan Paipim
() Suwit Injai
(✓) Kunchit Promprat
Issue Date : 07 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2411-0123WSC-4

Cert. No.: 24LM173
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	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	3240076	24I317	TPA	21 Mar 2025

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

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 9K0E0257

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
15.0	100	15.002	15.0	-0.002	0.16	2.00
30.0	100	30.003	30.0	-0.003	0.16	2.00
45.0	100	45.003	45.0	-0.003	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2719-9484



Certificate of Calibration

Cert.No.: 24CH1522
Page.: 1 of 3

Equipment : Conductivity Meter
Manufacturer : Horiba
Model : LAQUA-EC210
Serial No. : HCOJ0020
ID No. : UAE.EFM.078/2564(EFM.SCT.04/64)
Condition As-Received: Used Item
Received Date : 04 December 2024
Calibration Date : 06 December 2024
Reference : 2412-0103WSC-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 ± 15) %
Calibration Procedure: In-house method :
- CP-CH6 by direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lerngagtrakul

Approved by :
() Unnophol Harachai
() Ponpan Paipim
(✓) Sathip Meangmai
Issue Date : 06 December 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH1522
Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	24I995	09 Sep 2025
2) Ref. Std. Thermometer	4982054	110RC044	24I757	14 July 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1412.9 µS/cm	CPA Chem	1005307	15 June 2025
12.881 mS/cm	CPA Chem	1005308	15 June 2025

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1412.9 µS/cm

Conductivity Electrode Serial No.: 9B0K0167

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
1412.9 µS/cm	1379 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.881 mS/cm	11.57 mS/cm	12.40 mS/cm	0.086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration

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Cert.No.: 24CH1522
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

This equipment was connected with Temperature Probe;

- Model : 9383
- Serial No. : 9B0K0167

Dimension of probe;

- Length : 110 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Result : Without adjustment

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
15.0	15.003	15.0	-0.003	0.13	2.00
30.0	30.004	30.0	-0.004	0.13	2.00
45.0	45.003	45.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11/5/2024	10/5/2025
			Mettler Toledo	AB204-S/FACT / 1129361010	United Analyst and Engineering Consultant Co., Ltd.	250422 1 BL002 25	23/4/2025	22/4/2026
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2/4/2024	1/4/2025
			Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2502226-002-01	20/3/2025	19/3/2026
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2/4/2024	1/4/2025
			Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2502226-001-01	20/3/2025	19/3/2026
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ARCO	UC4-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24TM1113	11/7/2024	16/7/2025
5	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ARCO	UC4-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24TM1114	11/7/2024	10/7/2025
6	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ARCO	UR-1320 / -	Technology Promotion Association (Thailand-Japan)	24TM588	1/4/2024	31/3/2025
7	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	24TW39	21/2/2024	20/2/2025
			YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	25TW29	18/2/2025	16/2/2026
8	Digestion Units	TOTAL KJELDAHL NITROGEN	VELP/VELP Scientifica	DKL20 / 213517	National Food Institute Ministry of Industry, Thailand	2404228-001-01	26/8/2024	25/8/2025

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
9	SCT Meter	CONDUCTIVITY (umhos/cm)	Horiba	LAQUA-EC210 / HC1L0026	Technology Promotion Association (Thailand-Japan)	25CH246	26/2/2025	25/2/2026
10	Heating Block	CHEMICAL OXYGEN DEMAND	Hanna Instruments Inc.(Romania)	HI839800-02 / 4500052101	Hanna Instruments (Thailand) Ltd.	HIT-2427-0942	1/7/2024	30/6/2025
11	Hot Air Oven	TOTAL SUSPENDED SOLIDS	Memmert	UF55 / B216.1666	National Food Institute, Ministry of Industry, Thailand	2500116-001-01	8/10/2024	7/10/2025
12	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1/4/2024	31/3/2025
13	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	KT9 / 91905393	FOSS South East Asia	12875	5/7/2024	4/7/2025
14	pH Meter	pH	EcoSense	pH100A / JC04744	Technology promotion association (thailand-japan)	24CH452	23/4/2024	22/4/2025
15	pH Meter	pH	Horiba	LAQUA-PH210 / HA0A0007	technology promotion association (thailand-japan)	24CH399	2/4/2024	1/4/2025
			Horiba	LAQUA-PH210 / HA0A0007	technology promotion association (thailand-japan)	25CH353	20/3/2025	18/3/2026
16	pH Meter	pH	YSI Environmental	pH 100A / JC02729		24CH1070	27/8/2024	25/7/2025
17	SCT Meter	CONDUCTIVITY (umhos/cm)	YSI Environmental	Pro 30 / 18K100976	Technology Promotion Association (Thailand-Japan)	24CH1381	7/11/2024	6/11/2025
18	UV-VIS Spectrophotometer	TOTAL PHOSPHORUS	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
19	UV/VIS Spectrophotometer	CHEMICAL OXYGEN DEMAND	Hitachi	U-5100 / 23A4-008	DQE Services Co.,Ltd.	SP24-028	11/9/2024	9/9/2025

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	PARTICULATE MATTER (PM10) TOTAL SUSPENDED PARTICULATE	Mettler Toledo	MS204TS/00 / C252436235	National Food Institute, Ministry of Industry, Thailand	2502228-003-01	19/3/2025	18/3/2026
2	Dionex Aquion RFIC Ion Chromatography	SODIUM HYPOCHLORITE SULPHURIC ACID	Thermo Scientific	Dionex Aquion RFIC / 220380031	ARCHEMICA LAB CO., LTD	ID1047	23/4/2024	22/4/2025
3	Microbalance	RESPIRABLE DUST TOTAL DUST	Mettler Toledo	XP6 / B322373893	National Food Institute, Ministry of Industry, Thailand	2502228 002 01	20/3/2025	19/3/2026

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



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

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

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005



United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel.0 2763 2828 Fax 0 2763 2800 www.uaconsultant.com E-mail: uae@uaconsultant.com



Certificate of Calibration

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Sol Udom suk 41, Sukhumvit Rd., Bang Chak, Phar Khanong, Bangkok 10260

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Asset No.: UAE.WAS.002/2552
Building: N/A Floor: 1 Room: 107

Received Date: April 22, 2025

Date of Calibration : April 23, 2025

Calibration Conditions: Temperature 22.8 °C to 23.4 °C
Humidity 54.8 % to 68.9 %
Pressure 756.6 mmHg to 758.2 mmHg

Calibrated by: Sakkarin Srirahang

Approved by: Suwit Chotnok

Signature:

Issued Date: April 25, 2025

Note : 1) The Uncertainties are for a confidence probability of approximately 95%

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

3) 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 United Analyst and Engineering Consultant Co.,Ltd. (UAE)

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 2 of 3

Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 23, 2025
Condition As-Received: In Condition

Manufacturer: Mettler Toledo
Readability: 0.0001 g
ID No.: UAE.WAS.002/2552

Condition of Equipment:

Condition of This Result of Calibration:

1. Calibration Method: This instrument was calibrated by method UAE-CP-CAL-006 In-House Method based on UKAS Lab 14 : 2022

2. Reference Standards:

Reference Standard:	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (OIML)	1 mg to 1 kg	8749109122	AMARC	25-009359	Mettler-Toledo	21-Jan-27
Standard Weight Class F1 (OIML)	1 mg to 200 g	11119512	AMARC	24-013840	Mettler-Toledo	04-Feb-26
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Thermo-Hygro-Baro Meter	MH9-3825D	AK.46457	SUCCESS	SG-H-00997/67	Success Gateway	21-Nov-25
Thermo-Hygro-Baro Meter	MH9-3825D	AK.46457	TPA	25PT95	TPA	25-Feb-26

3. This certification is traceable to SI Unit

4. This certification 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. Through the reference standard laboratory of AMARC 25-009359 Calibration 0152

Calibration Result:

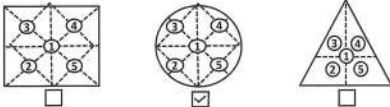
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200*	0.000045

2. Eccentric or off-center loading

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

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	Maximum Difference (g)
100.0000	99.9996	99.9997	100.0003	100.0005	0.0005

เอกสารไม่ควบคุม

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 3 of 3

Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 23, 2025

Manufacturer: Mettler Toledo
Readability: 0.0001 g
ID No.: UAE.WAS.002/2552

Calibration Result:

(Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Error of indication from nominal or conventional mass value:

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unload	0.0000000	0.0000	0.0000	0.10	2.05
0.01	0.0100025	0.0099	0.0001	0.10	2.05
0.05	0.0500056	0.0500	0.0000	0.10	2.05
0.1	0.1000012	0.0999	0.0001	0.10	2.05
0.5	0.5000133	0.5000	0.0000	0.10	2.05
1	1.0000105	1.0000	0.0000	0.10	2.05
10	10.000010	10.0000	0.0000	0.11	2.04
40	40.000076	40.0000	0.0000	0.14	2.00
50	50.000056	50.0000	0.0001	0.13	2.00
80	80.000107	80.0000	0.0001	0.18	2.00
100	100.000109	99.9999	0.0002	0.17	2.00
120	120.00015	119.9999	0.0003	0.21	2.00
150	150.000165	149.9998	0.0003	0.24	2.00
160	160.000175	159.9997	0.0005	0.26	2.00
200	200.000129	199.9998	0.0004	0.30	2.00

4. Effect of Tare test:

Tare Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000041	19.9999	0.0001
	40.000076	39.9998	0.0002
	60.000066	59.9997	0.0003
	80.000107	79.9999	0.0002
	100.000168	100.0004	-0.0003

Remark:

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

เอกสารไม่ควบคุม

o--o-End-o--o

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist
Date of Issue: 9 April 2024

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

The uncertainties are for a confidence probability of approximately 95%

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

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

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 2 of 4

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

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

Condition of Equipment: Good Condition

Condition of This Result of Calibration:

1. Calibration Method:	NFI Method W-MA-001		In-House Method based on UKAS Lab 14 : 2019		
2. Reference Standards:					
<u>Reference Standard</u>	<u>Model</u>	<u>Serial No.</u>	<u>Calibrated By</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M23040535	8 April 2024
<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Calibrated By</u>	<u>Certificate No.</u>	<u>Due Date</u>
Thermo-Hygro Meter	608-H3	NFLBTH 016/23	Quality Reborn	QB24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

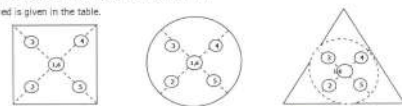
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

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

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.000000	0.00000	0.00000	0.0000087	2.00
0.001	0.001003	0.00100	0.00000	0.0000090	2.00
0.005	0.005002	0.00501	-0.00001	0.0000092	2.00
0.01	0.010003	0.01002	-0.00002	0.0000089	2.00
0.05	0.049996	0.05001	-0.00001	0.0000096	2.00
0.1	0.100011	0.10002	-0.00001	0.000011	2.00
0.5	0.500016	0.50004	-0.00002	0.000014	2.00
1	1.000003	1.00005	-0.00005	0.000016	2.00
2	2.000023	2.00006	-0.00004	0.000017	2.00
5	5.000015	5.00006	-0.00005	0.000020	2.00
10	10.000009	10.00005	-0.00004	0.000026	2.00
20	20.000030	20.00007	-0.00004	0.000037	2.00
30	30.000039	30.00009	-0.00005	0.000050	2.00
50	50.000028	50.00008	-0.00005	0.000068	2.00
80	80.000067	80.00013	-0.00006	0.00011	2.00

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

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nfi.or.th

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.0002	-0.00001	0.00015	2.00
100	100.00006	100.0001	0.00006	0.00016	2.00
110	110.00007	110.0002	-0.00001	0.00017	2.00
120	120.00009	120.0002	-0.00001	0.00018	2.00
130	130.00019	130.0002	-0.00001	0.00019	2.00
140	140.00013	140.0002	-0.00001	0.00019	2.00
150	150.00009	150.0002	-0.00001	0.00021	2.00
160	160.00019	160.0002	-0.00001	0.00022	2.00
170	170.00012	170.0002	-0.00001	0.00023	2.00
200	200.00013	200.0002	-0.00001	0.00028	2.00

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

----- End -----

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

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Calibration Certificate

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

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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

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Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 2 of 4

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

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

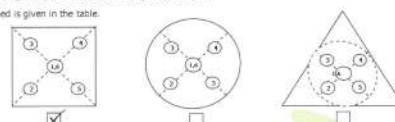
1. Repeatability of Reading:

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

2. Off-Center Error:

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

The balance reading obtained is given in the table.



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

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

เอกสารไม่ควบคุม



nfi.or.th

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

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

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

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

2008 บลจ.อเนกประสงค์ 35 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2008 Soi 35, Aun Anan Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545 **เอกสารไม่ควบคุม**

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 **Page 4 of 4**

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

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

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

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

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

2008 บลจ.อเนกประสงค์ 35 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2008 Soi 35, Aun Anan Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545 **เอกสารไม่ควบคุม**

Calibration Certificate

Certificate No.: 2502226-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udumsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C09071872

ID No.: UAE.WAO.012/2563

Order No.: 2502226

Operation No.: 2502226-001

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
Scientist

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

Date of Issue: 25 March 2025

The uncertainties are for a confidence probability of approximately 95%

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

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

2008 บลจ.อเนกประสงค์ 35 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2008 Soi 35, Aun Anan Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545 **เอกสารไม่ควบคุม**

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 **Page 2 of 4**

Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C Relative Humidity: 48 ± 3.5 %

Place of Calibration: 208 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	1mg to 200g	8505567572	TCS	M24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFL.BTH 017/23	Quality Reborn	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

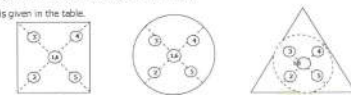
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000042
100	0.0000000
200	0.0000000

2. Off-Center Error:

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

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0002	0.0001

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

2008 บลจ.อเนกประสงค์ 35 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ
2008 Soi 35, Aun Anan Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545 **เอกสารไม่ควบคุม**

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.000000	0.00000	0.00000	0.0000089	2.00
0.001	0.001003	0.00100	0.00000	0.0000092	2.00
0.005	0.005002	0.00500	0.00000	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049995	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50000	0.00002	0.000014	2.00
1	1.000003	1.00001	-0.00001	0.000016	2.00
2	2.000023	2.00005	-0.00003	0.000017	2.00
5	5.000015	5.00005	-0.00003	0.000021	2.00
10	10.000009	10.00005	-0.00004	0.000026	2.00
20	20.000030	20.00012	-0.00009	0.000037	2.00
30	30.000039	30.00012	-0.00008	0.000050	2.00
50	50.000028	50.00014	-0.00011	0.000068	2.00
80	80.000067	80.00020	-0.00013	0.00011	2.00

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

2008/1888946/018-35 หมู่ 9 ตำบลบางคูรัด อำเภอบางกรวย จังหวัดนนทบุรี 11000
2008/501 35 Anon Amari Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-422-8668 Fax: +66(0) 2-422-8545

for N. Nigrochit

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.00002	-0.00001	0.000015	2.00
100	100.00006	100.00001	0.00000	0.000016	2.00
110	110.00007	110.00001	0.00000	0.000017	2.00
120	120.00009	120.00002	-0.00001	0.000018	2.00
130	130.00010	130.00002	-0.00001	0.000019	2.00
140	140.00013	140.00002	-0.00001	0.000019	2.00
150	150.00009	150.00002	-0.00001	0.000021	2.00
160	160.00010	160.00003	-0.00001	0.000022	2.00
170	170.00012	170.00003	-0.00001	0.000023	2.00
200	200.00013	200.00002	-0.00001	0.000028	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: 01 Date: 20-04-65

2008/1888946/018-35 หมู่ 9 ตำบลบางคูรัด อำเภอบางกรวย จังหวัดนนทบุรี 11000
2008/501 35 Anon Amari Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-422-8668 Fax: +66(0) 2-422-8545

for N. Nigrochit

เอกสารไม่ควบคุม



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



Certificate of Calibration

Cert. No.: 24TM1113
Page : 1 of 3

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UC4-1320
Serial No. : -
ID No. : UAE.WAO.002/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 11 July 2024
Calibration Date : 11 July 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama
Approved by :
() Ponpan Palipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-1
Procedure Used :-

Cert. No.: 24TM1113
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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

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

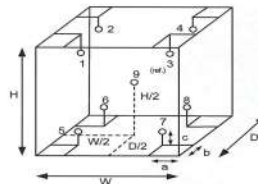
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	32
REL Humid. (%)	78	65
AC Supply (Volt)	233	234



Probe Installation Details :

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

Dimension of Chamber :

D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	19-16RTD-04
5	19-16RTD-05
6	19-16RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2407-0243OC-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 24TM1113
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
20.0	20.0	19.8	0.55	0.66	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.210	20.331	20.162	19.645	20.287	20.070	19.838	19.781	19.954	0.79

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

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

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

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

UUC* : Unit Under Calibration

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

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

-oOo-

เอกสารไม่ควบคุม



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



Certificate of Calibration

Cert. No.: 24TM1114
 Page : 1 of 3

Equipment : BOD Incubator
 Manufacturer : ARCO
 Model : UC4-1320
 Serial No. : -
 ID No. : UAE.WAO.018/2559
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Lab Floor 2
 Received Order : 11 July 2024
 Calibration Date : 11 July 2024
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

[Signature]

Approved Signatory

() Ponpan Paipim
 (✓) Suwit Imjai
 () Kunchit Promprat

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2407-0243OC-2

Cert. No.: 24TM1114
 Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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

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

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

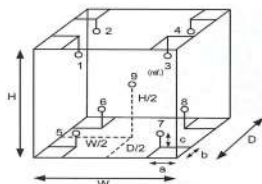
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	29
REL.Humid. (%)	78	72
AC Supply (Volt)	233	234

Position :	Ref. Std. ID No.:
1	20-16RTD-10
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09



Probe Installation Details :

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

Dimension of Chamber :

D = 0.62 m
 W = 1.2 m
 H = 1.2 m
 Capacity = 0.89 m³

-oOo-

เอกสารไม่ควบคุม



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2407-0243OC-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 24TM1114
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.361	19.640	20.312	20.079	19.908	19.872	19.955	19.818	19.758	0.48

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 %.

เอกสารไม่ควบคุม



Cert. No.: 24TM588
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. : -
ID No. : UAE.WAO.006/2553
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Krisda Malee
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat
Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0065064



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2404-0004OC-2
Procedure Used :-

Cert. No.: 24TM588
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

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

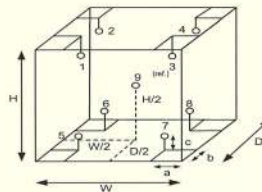
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	27
REL.Humid. (%)	45	47
AC Supply (Volt)	220	221



Probe Installation Details :

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

Dimension of Chamber :

D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

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

เอกสารไม่ควบคุม

a 1209741

UAE.FM.6.4.016-1(01/09-SEP-2020)



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2404-0004OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM588
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.47	0.69	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.289	19.835	20.129	19.985	20.190	20.180	20.300	20.457	20.248	0.67

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 1209740

กำหนดจุดห้ามใช้งาน

References Certificate Number. : 234TM588

Equipment : BOD Incubator

Model : UR-1320

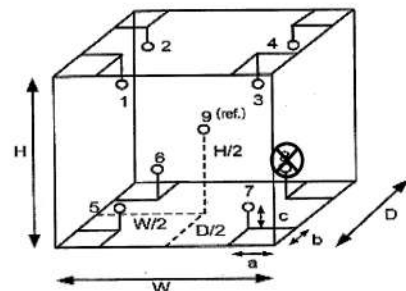
Serial No. : -

ID No. : UAE.WAO.006/2553

Manufacturer : ARCO

Calibration Point : 20.0 °C

Unit Under Calibration Setting : 20.0 °C



รูปภาพเครื่องมือ แสดงจุดที่ได้รับการสอบเทียบ และสัญลักษณ์ X แสดงจุดห้ามใช้งาน

กำหนดจุดห้ามใช้งานตำแหน่งที่...8.....

หมายเลข เก็บใบแน้ม.....

\\uae.netapp\Lab-B\INSTRUMENT\31-216-6\Certificate\กำหนดจุดห้ามใช้งานเครื่องมือ 2567\กำหนดจุดห้ามใช้งาน.doc

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirithean

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Unnophol Harachai
(✓) Saithip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
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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เอกสารไม่ควบคุม



Cert.No.: 25TW29
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 14 February 2025
Test Date : 17 February 2025
Reference : 2502-0473DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean
Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 18 February 2025

เอกสารไม่ควบคุม



Cert.No.: 25TW29
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 24F100202

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.22	8.22	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

-o0o-

เอกสารไม่ควบคุม

Verification Certificate

Certificate No.: 2404228-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchack, Prakhonng, Bangkok 10260

Page 1 of 4

Equipment:	Digestion Unit (Heating Block)
Manufacturer:	VELP SCIENTIFICA
Model:	DKL20
Serial No.:	213517
ID No.:	UAE.WAS.005/2555
Order No.:	2404228
Operation No.:	2404228-001
Date of Receipt:	26 August 2024
Date of Calibration:	26-27 August 2024

Calibrated by **Mr. Worapob Sookthong**
Scientist

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

Date of Issue: **30 August 2024**

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

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

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

เอกสารไม่ควบคุม

2008 ๒๕๕๓-๒๕๕๔ : 35 หมู่ ๕ ตำบลบ้านใหม่ อำเภอเมือง จังหวัดนนทบุรี 11000
2008 501 35, Anin Amnien Road, Bang N, Khan Subaduln, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66(0) 24-22 8608 Fax : +66(0) 24-22 8513

Verification Report

Certificate No.:	2404228-001-01
Equipment:	Digestion Unit (Heating Block)
	Model: DKL20 Serial No.: 213517
	Resolution: 1 °C ID No : UAE.WAS.005/2555
	Manufacturer: VELP SCIENTIFICA
Date of Calibration:	26-27 August 2024

Page 2 of 4

Location: Dry Laboratory (312), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Environment Condition:

Ambient Temperature	(29 ± 1)	°C
Relative Humidity	(60 ± 2)	%
Line Voltage	(224 ± 1)	Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert standard thermocouples type R into its Digestion blocks and Calibration according to NFI Method W-TE-026 based on BS 4309 : 1968

- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A	MY94045576/MY11194453	TC24/0063	5-Jun-2025	N.M, Technical Center Laboratory
	Type R	R/CH1 to R/CH3			

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

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

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

6. Condition of Calibrated item : Good


UUC* Description						
Time of Record	1	Hour	6	Minute	At	380 °C

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

เอกสารไม่ครบคุณ

2009 ตีพิมพ์ในวารสาร 35 บทความตีพิมพ์ในวารสาร 10700
 6008 Soi 36, Anurajit Road, Bang Yi Khan Subdinst, Bang Phai District, Bangkok 10700, Thailand
 Tel: +66(0) 2422 8559 Fax: +66(0) 2422 8545

เอกสารไม่ควบคุม



Verification Report

Certificate No.:	2404228-001-01		
Equipment:	Digestion Unit (Heating Block)		
	Model: DKL20	Serial No.:	213517
	Resolution: 1 °C	ID No.:	UAE.WAS.005/2555
	Manufacturer: VELP SCIENTIFICA		
Date of Calibration:	26-27 August 2024		

Page 3 of 4

Calibration result:

Table 1 : Reporting

Block No.	UUC* Setting	U
-----------	--------------	---

Block No.	(°C)	(°C)	Stability (±°C)	Thermometer (°C)	(±°C)
1	380	380	0.21	380.14	2.0
2	380	380	0.21	380.70	2.0
3	380	380	0.12	381.17	2.0
4	380	380	0.12	379.82	2.0
5	380	380	0.20	381.01	2.0
6	380	380	0.16	380.48	2.0
7	380	380	0.19	379.35	2.0
8	380	380	0.25	380.27	2.0
9	380	380	0.17	382.28	2.0
10	380	380	0.35	380.98	2.0
11	380	380	0.30	380.35	2.0
12	380	380	0.23	382.38	2.0
13	380	380	0.17	378.95	2.0
14	380	380	0.18	379.69	2.0
15	380	380	0.16	382.06	2.0
16	380	380	0.14	380.14	2.0
17	380	380	0.16	381.09	2.0
18	380	380	0.15	382.71	2.0
19	380	380	0.25	381.32	2.0
20	380	380	0.25	381.21	2.0

Note:

- UUC* = Unit Under Calibration

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

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

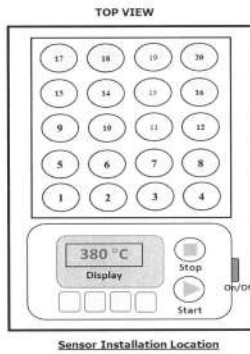
เอกสารไม่ควรดู

2008 501 35, Anu (Anant) Road, Bang M Khan Subdistr., Bang Phrae District, Bangkok 10700, Thailand.
Tel: +66(0) 2422 8508 Fax: +66(0) 2422 8545

Verification Report

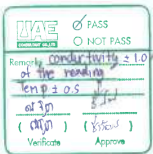
Certificate No.: 2404228-001-01
Equipment: Digestion Unit (Heating Block)
 Model: DKL20 Serial No.: 213517
 Resolution: 1 °C ID No.: UAE.WAS.005/2555
 Manufacturer: VEP SCIENTIFICA
Date of Calibration: 26-27 August 2024 Page 4 of 4
Calibration point: 380 °C
Calibration result: Continued

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



----- End -----

FCS 012 Revision: 01 Date: 28-04-55



Certificate of Calibration

Cert.No.: 25CH246
Page: 1 of 3

Equipment : Conductivity Meter
Manufacturer : Horiba
Model : LAQUA-EC210
Serial No. : HC1L0026
ID No. : UAE.EFM.015/2565(EFM.SCT.02/65)
Condition As-Received: Used Item
Received Date : 25 February 2025
Calibration Date : 26 February 2025
Reference : 2502-0787WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure: In-house method :
 - CP-CH6 by direct measurement
 with certified reference material (CRM)
 - CP-CH8 by comparison with temperature standard
Calibrated by : Warakorn Lernagtrakul
Approved by :
 Approved Signatory
 () Chakrit Waewwanjua
 () Ponpan Paipim
 (✓) Sathip Meangmai
Issue Date : 27 February 2025

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.

Cert.No.: 25CH246
Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	24I995	09 Sep 2025
2) Ref. Std.Thermometer	4982054	110RC044	24I757	14 July 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
1412.9 µS/cm	CPA Chem	1005307	15 June 2025
12.881 mS/cm	CPA Chem	1005308	15 June 2025

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1412.9 µS/cm

Conductivity Electrode Serial No.: 9B1J0077

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
1412.9 µS/cm	1471 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.881 mS/cm	13.33 mS/cm	12.90 mS/cm	0.086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration



Cert.No.: 25CH246
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

This equipment was connected with Temperature Probe;

- Model :	9383
- Serial No. :	9B1J0077
Dimension of probe;	
- Length :	110 mm
- Diameter :	16 mm
- Immersion Depth :	90 mm

Calibration Result : Without adjustment

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
15.0	15.002	15.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
45.0	45.002	45.1	0.098	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Hanna Instruments (Thailand) Ltd.

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok,
Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198



Certificate No. : HIT-2427-0942

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Equipment :	COD Test Tube Heater	Serial No. :	04500052101
Meter Model :	H1839800-02	Resolution :	0.1°C
Tube Heater :	25 Vial Capacity	Temperature of Reaction :	150°C
Temperature Range :	(-10 to 160)°C	Manufacturer :	Hanna Instruments
Manufacturer :	Hanna Instruments	Made in :	Romania
Condition As-Received :	Used Product	Reference :	RE241152
Ambient Temperature :	(25 ± 2)°C	Relative Humidity :	(50 ± 15)%RH
Customer name :	United Analyst and Engineering Consultant Co., Ltd.		

3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,
Phrakhanong, Bangkok 10260

Received date : 26 June 2024

Calibrate date : 1 July 2024

Issue date : 3 July 2024

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibration Procedure : This calibrator was conducted by using in-house: calibration procedure
CP-04 by using certified reference standard instruments.

Calibrated by : ☒ Mr. Pichit Petthong
☐ Mr. Channarong Soinak

Approved by :
Mr. Anan Suwanchaisakul
Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **

approval of the head of Hanna Instrument (Thailand).

เอกสารไม่ควบคุม



Certificate No. : HIT-2427-0942

Page : 2 of 2

Condition of this calibration result:

Reference Standard Instruments : This certification is traceable to the international unit of unit maintained through:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2307-164-1	WK Electric Co., Ltd.
Digital Thermo-Hygrometer	HT-771SD	AL07155	24H41	Technology Promotion Association (Thailand-Japan).

Calibration Result:

Measurement Temperature Source Accuracy for COD Reactor.

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty of Measurement (± °C)
25 Vial	150.0	149.8	0.48

Unit : °C

(1A)	(2A)	(3A)	(4A)	(5A)
149.574	149.873	149.861	149.748	149.878
(1B)	(2B)	(3B)	(4B)	(5B)
149.490	149.940	149.954	150.103	150.048
(1C)	(2C)	(3C)	(4C)	(5C)
149.625	150.036	150.080	150.015	149.580
(1D)	(2D)	(3D)	(4D)	(5D)
149.801	149.541	149.662	150.010	149.499
(1E)	(2E)	(3E)	(4E)	(5E)
149.563	149.611	149.569	149.831	149.762

Figure: Shows the location of the temperature source.

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

** End of certificate **

เอกสารไม่ควบคุม



มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการข้อมูลวิชาการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2500116-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMMERT
Model: UF55
Serial No.: B216.1666
ID No.: UAE.WAO.027/2559
Order No.: 2500116
Operation No.: 2500116-001
Date of Receipt: 8 October 2024
Date of Calibration: 8 October 2024

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 October 2024

The uncertainties are for a confidence probability of approximately 95 %.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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

เอกสารไม่ควบคุม

2500116-001-01
2008 301 35 Anan Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10710, Thailand
Tel: +66(0) 2422 8888 Fax: +66(0) 2422 8888

nfi.com

Calibration Report

Certificate No.: 2500116-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF55 Serial No.: B216.1666
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT
Date of Calibration: 8 October 2024 Page 2 of 3

Location: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (30.3 ± 1) °C
Relative Humidity (55 ± 1) %
Line Voltage (230 ± 3) Volt

Condition of this results of Calibration:

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

2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY57003188	TE 670486-01	8 June 2025	NATIONAL FOOD INSTITUTE
	RTD	CHP201-209/RTD#201-209			

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

UUC Description :

Time of Record	1 Hour	9 Minute	At	104.0, 140.0 and 180.0 °C
Fresh air Damper	-	Open	Position	-
	X	Close	Fan	40%
	-	Not Available		

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-812 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2500116-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF55 Serial No.: B216.1666
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT
Date of Calibration: 8 October 2024 Page 3 of 3

Calibration point: 104.0, 140.0 and 180.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	29.3	54	227.0
MAX	31.2	56	232.0

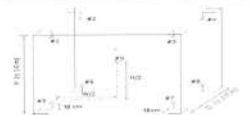


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0	103.89	103.66	103.88	103.89	104.40	103.98	103.70	104.10	104.15	0.53
140.0	139.85	139.53	139.67	139.88	140.67	140.00	139.60	140.25	140.23	0.73
180.0	179.63	179.22	179.71	179.76	181.03	180.06	179.41	180.87	180.39	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.15	0.49	0.88
140.0	140.0	140.0	140.0	0.13	0.71	1.2
180.0	180.0	180.0	180.0	0.13	1.2	1.9

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

UUC* = Unit Under Calibration

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

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

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

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

----- End -----

F-CS-812 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



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



Cert. No.: 24TM589
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 : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee
Approved by :
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0055065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and 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	23LM115	TPA	11 Jul 2024

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

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

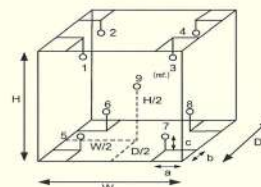
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.50 m
W = 0.80 m
H = 0.75 m
Capacity = 0.30 m³

Position :	Ref. Std. ID No. : @ Calibration Point	
	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.870	179.594	179.790	180.287	179.961	179.802	1.1

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 1209738

FOSS

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

Customer Service Report

Report No.: 12875

Date: July 5, 2024
Job No.: 8315
Instrument: KTA Distillator

Customer: UAE
Address: Bangkok
Serial: 91405393

Travel To Customer (Hrs)
Start 09.30
Finish 09.30

Labour (Hrs)
09.30
14.30

Travel From Customer (Hrs)
14.30
16.00

Application		Special		Standard	
Distributor	»	Courtesy Visit	»	Installation	»
Digital Service	»	PMA Onboarding	»	Quote	»
Internal	»	Warranty	»	Repair	»
Investigate	»	Sales Support	»	Remote	»
				Health Check Visit	»

PMA Type	Smartcare	Smartcare Pro	Fosscore	A
	Smartcare Advance	Fosscore Pro	N/A	

Details of Work / Test	
- PM -	
- Visual Check -	
+ No leak	
+ No drawing	
- Change PM kit x1 set	
- Function Check -	
+ Dilution 80 mL →	
+ Alkali 50 mL →	
+ Receiver N/A → Notice	
+ Hecm / Drain	
Blank =	
Follow up	
Instrument Ready for Use	OK
	X
	Not OK*

Part No.	Batch	Description	Qty
60100196	03-01-2024	PM kit Kjetec & Distillator	7

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

Email: Customer Contact: Remark:

เอกสารไม่ควบคุม



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



Certificate of Calibration

Cert.No.: 24CH452
Page: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSence
Model : pH100A
Serial No. : JC04744
ID No. : UAE.EFM.058/2566(EFM.pH.01/66)
Condition As-Received: Used Item
Received Date : 22 April 2024
Calibration Date : 23 April 2024
Reference : 2404-0487WSC-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 ± 15) %
Calibration Procedure : In - house method ;
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagtrakul

Approved by : Sathip
Approved Signatory

() Unnophol Harachai
() Ponpan Palim
(✓) Sathip Meangmai

Issue Date : 25 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 24CH452
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-

- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2026
pH 6.986	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	177	4.01	0.58	2.00
S/N: JC04744	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 24CH452
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N : 230906SIA605377	4.008	4.01	174	0.0071	2.00
	6.986	7.00	0	0.0093	2.00
	6.986	6.99	0	0.0089	2.00
	9.997	10.00	-175	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 230906SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 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	25.002	25.1	0.098	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
35.0	35.003	35.1	0.097	0.13	2.00

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 24CH399
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0007
ID No. : UAE.EFM.002/2563(EFM.pH.02/63)
Condition As-Received: Used Item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 \pm 2.5) $^{\circ}\text{C}$
Relative Humidity : (50 \pm 15) %
Calibration Procedure :
In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by :
Sathip
Approved Signatory

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Sathip Meangmai

Issue Date : 06 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0062139



Cert.No.: 24CH399
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N : HAOA0007	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00



Cert.No.: 24CH399
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N : Q92M0181	4.008	4.01	180.2	0.0079	2.00
	6.986	6.98	1.3	0.0099	2.00
	6.986	7.00	-0.9	0.0099	2.00
	9.997	10.00	-169.4	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-10D
- Serial No. : Q92M0181
Dimension of probe
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 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	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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a 1209881

เอกสารไม่ควบคุม

a 1209882



Certificate of Calibration

Cert.No.: 25CH353
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0007
ID No. : UAE,EFM.002/2563(EFM,pH.02/63)
Condition As-Received: Used Item
Received Date : 18 March 2025
Calibration Date : 20 March 2025
Reference : 2503-0612WSC-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 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : Uthen Kankawi
Approved by : _____
Approved Signatory
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 20 March 2025

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.

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
: 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 4.007	CPA chem	1066665	18 Jan 2027
pH 6.999	Hach Lenge GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator 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.: HA0A0007	4.00	177.48	177.6	4.01	0.058	2.00
	7.00	0.00	0.3	6.98	0.058	2.00
	7.00	0.00	0.3	6.98	0.058	2.00
	10.00	-177.48	-177.1	10.01	0.058	2.00



Cert.No.: 25CH353
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 992H0385	4.007	4.00	150.1	0.0085	2.05
	6.999	7.00	-26.1	0.0095	2.00
	6.999	7.00	-26.7	0.011	2.05
	10.010	10.01	-202.4	0.010	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. : 992H0385
Dimension of probe
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.006	15.0	-0.006	0.13	2.00
30.0	29.998	30.0	0.002	0.13	2.00
45.0	44.993	45.0	0.007	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE,EFM.195/2561(ENV,pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-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 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemaoatrakul

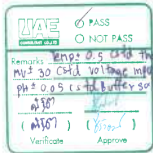
Approved by : _____
Approved Signatory

() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 29 August 2024

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.



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	23I1216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

: The measurement results are traceable to SI through Hach Lenge GmbH LT Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

: 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 4.006	Hach Lenge GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lenge GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC02729	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 231018SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	2.00

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

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



Certificate of Calibration

Cert.No.: 24CH1381
Page.: 1 of 3

Equipment : Conductivity Meter
Manufacturer : YSI
Model : Pro 30
Serial No. : 18K100976
ID No. : UAE.EFM.071/2562(ENV.SCT.01/62)
Condition As-Received: Used Item
Received Date : 05 November 2024
Calibration Date : 06 November 2024
Reference : 2411-0124WSC-2
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure: In -house method :
- CP-CH6 by direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by : Approved Signatory

() Unnoppol Harachai
() Ponpan Paipim
(✓) Sathip Meangmai

Issue Date : 11 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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

Condition of this result of calibration

1. Reference Standard Instrument :-

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermometer	1963878	130RC095	24I995	09 Sep 2025
2) Ref. Std. Thermometer	4982054	110RC044	24I757	14 July 2025

- This Certification is traceable to SI Throught Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Conductivity Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
1412.9 µS/cm	CPA Chem	1005307	15 June 2025
12.881 mS/cm	CPA Chem	1005308	15 June 2025

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1412.9 $\mu\text{S}/\text{cm}$

Conductivity Electrode Serial No.: 18L00008

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
1412.9 $\mu\text{S/cm}$	1146 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	9.2 $\mu\text{S/cm}$	2.00
12,881 mS/cm	10,17 mS/cm	12,48 mS/cm	0,086 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration



Calibration Results

Function : Temperature Measurement

This equipment was connected with Temperature Probe:

- Model :	9383
- Serial No. :	18L00008

Dimension of probe;

- Length :	<u>104</u>	mm
- Diameter :	<u>16</u>	mm
- Immersion Depth :	90	mm

Calibration Result : Without adjustment

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor <i>k</i>
15.0	15.004	14.9	-0.104	0.13	2.00
30.0	30.002	29.9	-0.102	0.13	2.00
45.0	45.005	45.0	-0.005	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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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



ISO 9001
CALIBRATION DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-001

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 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 3 January 2025

Calibration Date : 3 January 2025

Issue Date : 8 January 2025

Condition Instrument : Good

Page 1 of 5

Calibrated by : ปัทม

(Mr.Tanawut Rittidach)

Technical Manager

Approved by : ชลธิชา

(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 DQE Services Co., Ltd.

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

NIST-101318-0105
CALIBRATION MARK

REPORT OF CALIBRATION

Certificate No. : SP25-001

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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.


Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

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


ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 3 of 5

Calibration Results : Without adjustment


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

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FM-708-02 R01 1/11/2021

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


ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 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
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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ISO 17025:2017
CALIBRATION DATA

REPORT OF CALIBRATION

Certificate No. : SP25-001Page 5 of 5


Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.1	0.62	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	0.18	2.00

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FM-708-02 R01 1/11/2021

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ISO 17025:2017
CALIBRATION DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP24-028Page 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-5100

Serial No. : 23A4-008


ID No. : UAE.WAS.010/2567


Received Date : 10 September 2024

Calibration Date : 10 September 2024

Issue Date : 13 September 2024

Condition Instrument : Good

Calibrated by : 
(Mr.Tanawat Rittidach)
Technical Manager

Approved by : 
(Ms. Chonthicha Sangern)
Quality Manager


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

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

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
DQE Services
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REPORT OF CALIBRATION

Certificate No. : SP24-028

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	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 5.0 nm.

Scan Speed of UUC : 40


Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP24-028

Page 3 of 5


Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.044	0.0044	0.0029	2.00
	2.1876	2.190	-0.0024	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.557	0.0025	0.0034	2.00
	1.0239	1.021	0.0029	0.0035	2.00
	2.1230	2.121	0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.519	0.0040	0.0029	2.00
	0.9633	0.961	0.0023	0.0028	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.515	0.0031	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.996	0.0013	0.0085	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.549	0.0027	0.0030	2.00
	1.0803	1.078	0.0023	0.0029	2.00
	2.0373	2.031	0.0063	0.0081	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.557	0.0021	0.0031	2.00
	1.0518	1.049	0.0028	0.0029	2.00
	1.9274	1.923	0.0044	0.0080	2.00

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP24-028


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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
	0.7469	0.743	0.0039	0.0056	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.862	0.0054	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.291	0.0009	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.639	0.0040	0.0055	2.00

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP24-028

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.00	240.4	0.60	0.18	2.00
279.30	278.7	0.60	0.18	2.00
288.90	288.5	0.40	0.18	2.00
334.50	334.2	0.30	0.18	2.00
361.40	361.1	0.30	0.18	2.00
418.40	418.0	0.40	0.18	2.00
447.20	446.7	0.50	0.18	2.00
459.30	459.6	-0.30	0.18	2.00
537.00	536.6	0.40	0.18	2.00
638.00	637.4	0.60	0.18	2.00
441.29	440.8	0.49	0.18	2.00
479.88	479.6	0.28	0.18	2.00
513.75	513.5	0.25	0.18	2.00
528.59	528.6	-0.01	0.18	2.00
575.10	574.9	0.20	0.18	2.00
585.56	585.3	0.26	0.20	2.00
684.70	684.1	0.60	0.18	2.00
740.51	740.0	0.51	0.20	2.00
747.61	747.2	0.41	0.18	2.00
807.04	806.3	0.74	0.18	2.00
879.68	878.9	0.78	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%

- End of Certificate -

เอกสารไม่ควบคุม
FM-708-02 R01 1/11/2021

Calibration Report

Certificate No.: 2502228-002-01
Equipment: Electronic Balance
Model: XPe
Serial No.: 8322373893
Capacity: 6.1 g
Manufacturer: METTLER TOLEDO
Resolution: 0.000001 g
ID No.: UAE.AIR.019/2556

Date of Calibration: 20 March 2025 **Page 2 of 3**

Environment Condition: Ambient Temperature: 22.8 ± 0.4 °C Relative Humidity: 46 ± 0.95 %

Place of Calibration: 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M24641005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH D17/23	Quality Reborn	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

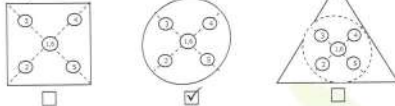
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
3	0.00000079
6	0.00000067

2. Off-Center Error:

A mass of 2 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
2.000018	2.000017	2.000014	2.000014	2.000024	2.000019	0.000066

for N. ingorbatt

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

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2008 Bangkok, Suite 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 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1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1703, 1704, 1705, 1706, 1707, 1708, 1709, 1710, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1788, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 211

PM Anion ID#1047

Preventive Maintenance Check List



Checklist ICS Preventive Maintenance

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
United Analyst and Engineering Consultant Co., Ltd.	Khun Suwan Kongthong / Lab
Engineer	Date
Mr.Channarong Khiao-Un	23-24/Apr/2024

Instrument Detail

Instrument Model	Application
AquionRFIC	Anion
Instrument components	Serial Number
AquionRFIC	220380031
AS-DV	220360045

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS18	AG18	ADRS-600	-	EGC III KOH
				CR-ATC

Remark: ตรวจพบการไหล Column, Guard Column และ Suppressor ผิดเพี้ยน peak shift และ tail

Perform By Archemica

K. Channarong Khiao-Un
Archemica
Date 23/Apr/2024



Customer
Customer
Date 23/Apr/2024

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เอกสารไม่ควบคุม



Checklist ICS Preventive Maintenance

General ICS Maintenance Checklist

No.	Description	Result				
Power on & Connection		Checked	Cleaned	Replaced	N.A.	
1	Instrument power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
2	Instrument connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
Injection Valve Rebuild		Checked	Cleaned	Replaced	N.A.	
3	Rebuilt injection valve 6 port	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	- Rotor seal	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	- Stator face	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(Optional) Auxiliary Valve Rebuild		Checked	Cleaned	Replaced	N.A.	
6	Rebuilt auxiliary valve - port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Check Valve Cartridge		Checked	Cleaned	Replaced	N.A.	
9	Inlet check valve assembly	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	Outlet check valve assembly	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	Verified correct flow orientation	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
Pump/Piston Rinse Seal, Piston Seal and Piston		Checked	Cleaned	Replaced	N.A.	
12	Piston rinse seal in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	Piston seal in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14	Piston in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15	Piston rinse seal in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Piston seal in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	Piston in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Waste Valve and Priming Valve		Checked	Cleaned	Replaced	N.A.	
18	Waste valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19	Priming valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cell Detector		Checked	Cleaned	Replaced	N.A.	
20	Check conductivity cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21	Check electrochemical cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22	- Working electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23	- Reference electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24	- Gasket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25	- Cell body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Other		Checked	Cleaned	Replaced	N.A.	
26	Sample Loop Size 25 uL	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
27	End-line filter	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	
28	Leak sensor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
29	Lubricate pump mechanic	<input type="checkbox"/>	Lubricated	-	<input type="checkbox"/>	
30	Reconnected liquid lines to the valve	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
31	Reconnected liquid lines to pump heads	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
32	Primed pump	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
33	Checked pump for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	
34	Checked gas for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>	

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Checklist Sampler Preventive Maintenance

AS-DV Autosampler Preventive Maintenance Checklist

Model	Serial number	Firmware Version
<input checked="" type="checkbox"/> AS-DV	220360045	1.6.0

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1.	AS-DV power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2.	AS-DV connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Sampling Tip		Checked	Cleaned	Replaced	N.A.
3.	Sampling needle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Sampling tubing (Transfer line)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Reconnect sampling needle & tubing	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
6.	Check carousel movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
7.	Check needle movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
8.	Lubricate needle drive	<input type="checkbox"/>	Lubricated	-	<input type="checkbox"/>
9.	AS-DV cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) High Pressure Valve		Checked	Cleaned	Replaced	N.A.
10.	High pressure valve - Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12.	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.	- Reconnected liquid line to the valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Others / comments

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PM Cation ID#1048

Preventive Maintenance Check List



Checklist ICS Preventive Maintenance

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
United Analyst and Engineering Consultant Co.,Ltd.	Khun.Suwan Kongthong / Lab
Engineer	Date
Mr.Channarong Khiao-Un	23-24/Apr/2024

Instrument Detail

Instrument Model	Application
Aquion	Cation
Instrument components	Serial Number
Aquion	220340349

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
CS12A	CG12A	CDER-600	-	-

Remark: ระบบไฟฟ้าและเครื่องใช้ภายในห้อง, System ยังไม่ผิดปกติ

Perform By Archemica

Archemica

Date

23/Apr/2024



Customer

Date

เอกสารไม่ควบคุม

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Checklist ICS Preventive Maintenance

General ICS Maintenance Checklist

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1	Instrument power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2	Instrument connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Injection Valve Rebuild		Checked	Cleaned	Replaced	N.A.
3	Rebuilt injection valve s port	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	- Rotor seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	- Stator face	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) Auxiliary Valve Rebuild		Checked	Cleaned	Replaced	N.A.
6	Rebuilt auxiliary valve - port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Check Valve Cartridge		Checked	Cleaned	Replaced	N.A.
9	Inlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Outlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Verified correct flow orientation	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Pump Piston Rinse Seal, Piston Seal and Plaston		Checked	Cleaned	Replaced	N.A.
12	Piston rinse seal in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Piston seal in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Piston in primary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Piston rinse seal in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Piston seal in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Piston in secondary pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste Valve and Priming Valve		Checked	Cleaned	Replaced	N.A.
18	Waste valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Priming valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cell Detector		Checked	Cleaned	Replaced	N.A.
20	Check conductivity cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Check electrochemical cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	- Working electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	- Reference electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	- Gasket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	- Cell body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
26	Sample Loop Size 25 uL	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	End-line filter	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
28	Leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Lubricate pump mechanic	<input type="checkbox"/>	Lubricated	-	<input type="checkbox"/>
30	Reconnected liquid lines to the valve	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
31	Reconnected liquid lines to pump heads	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
32	Primed pump	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
33	Checked pump for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
34	Checked gas for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

CM OQ

Chromeleon Operation Qualification

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification

General Information

Computer Name Version Number:
Instrument Controller: DESKTOP-C4FS3L7 7.3.1 Build 6535
Client: DESKTOP-C4FS3L7 7.3.1.6535
Operator: Mr.Channarong Khiao-Un

Overall Test Result: **Passed**

Comparison Format:

All Parameters:	Significant Digits:	10
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K. Channarong 23/Apr/2024

Reviewer's Signature // Date

Operator's Signature // Date

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Detection Algorithm: Cobra
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Report Variable	Peak Name	Status
Offset (c0)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Slope (c1)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Correlation Coeffi.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Std. Deviation	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Rel. Std. Dev.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

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ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EP/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: **Passed**

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra
Calibration Type: Lin, WithOffset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Variable Category	Report Variable	Peak Name	Status
Injection	No.		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
	Noise		ok
Peak Results	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution(EP)	Acetophenone	ok
	Resolution(USP)	Acetanilide	ok
	Resolution(USP)	Acetophenone	ok
	Asymmetry(EP)	Acetanilide	ok
	Asymmetry(EP)	Acetophenone	ok
	Asymmetry(EP)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Abs.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Ref.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor.Plates (JP)	Acetanilide	ok
	Theor. Plates(JP)	Acetophenone	ok
	Theor. Plates(JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok
	RF-Value	Acetanilide	ok
	RF-Value	Acetophenone	ok
	RF-Value	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	ok
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Acetophenone	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Amount	Propiophenone	ok
Component	Cal.Type	Acetanilide	ok
	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok
	Conc.Unit	Acetophenone	ok
	Conc.Unit	Acetophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max at	Acetanilide	ok
	Rel.Max at	Acetophenone	ok
	Rel.Max at	Propiophenone	ok
	Rel.Max at	Propiophenone	ok
	Rel.Max at	Propiophenone	ok
	Rel.Max at	Propiophenone	ok

Test Result: Passed

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 3

System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
System Suitability	Number	ok
	Name	ok
	Inj.Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
Test Case	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
	Inj. Eval. Result	ok
	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
System Suitability	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
Test Case Result	Sum	ok
	Sum	ok

Test Result: Passed

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Chromeleon

Part 1 - Verification of Selected Results	PASS
Part 2 - Most Frequently Used Parameters: Comparison with Expected Results	PASS
Part 3 - System Suitability Test: comparison with Expected Results	PASS



OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Gammakorn</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

TEST EQUIPMENT AND STANDARDS

Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal/Ver Date	Good Until
Multimeter	Fluke	289	27970244	N/A	N/A
Thermocouple	Fluke	K-Type	27970244	N/A	N/A
Balance	Mettler Toledo	AB204-S	1129361010	N/A	N/A
IC Qualification	Thermo Scientific	Test Box	21379153	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Standards/Chemicals

Description	Manufacturer	Concentration	Part Number	Lot Number	Expiration Date
Nitrate	Thermo Scientific	5 ppm	060254	231226	Dec-2024
Nitrate	Thermo Scientific	10 ppm	060254	231226	Dec-2024
Nitrate	Thermo Scientific	25 ppm	060254	231226	Dec-2024
Nitrate	Thermo Scientific	50 ppm	060254	231226	Dec-2024
Nitrate	Thermo Scientific	100 ppm	060254	231226	Dec-2024
Nitrate	Thermo Scientific	1000 ppm	060254	231226	Dec-2024
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A



Field Service Representative Signature:	Customer Signature:
<i>K. Gammakorn</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

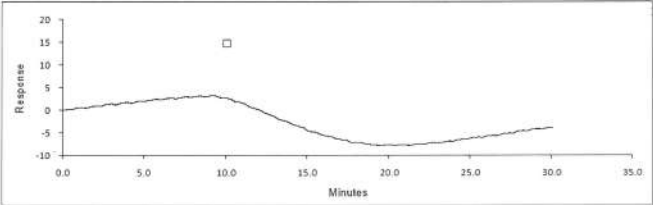
เอกสารไม่ควบคุม

PQ Anion ID#1047

Performance Qualification

เอกสารไม่ควบคุม

NOISE AND DRIFT (CD)



Information

System Name	Aquion RFIC
Detector SN	220360045
Data Path	chrom://desktop-c4fs3i7/ChromeleonLocal/Archemica/Service Contract/Validate 2024/1PM1PQ 23-04-24/Anion/IC OQ.seq/278.smp/ECD_1.channel

Noise and Drift

Test	Measured (nS)	OQ Limit (nS)	Result	Conversion Factor
Noise	1.1 nS	≤ 2.0 nS	PASS	1000
Drift	16.1 nS/hr	≤ 20.0 nS/hr	PASS	1000



OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Gammakorn</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

Information

System Name	Aquion RFIC
Detector SN	220360045
Data Path	ChromeleonLocal://Archemica/Service Contract/Validate 2024/1PM1PQ 23-04-24/Anion/IC OQ

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Repeatability 01	25	0.265	2.825
Repeatability 02	25	0.265	2.822
Repeatability 03	25	0.265	2.831
Repeatability 04	25	0.265	2.835
Repeatability 05	25	0.265	2.834
Repeatability 06	25	0.265	2.836

Repeatability

Test	Measured (% RSD)	OQ Limit (% RSD)	Result
Retention Time	0.0	≤ 5.0	PASS
Area	0.2	≤ 1.0	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Rattanaporn</i>	<i>Surin</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

Information

System Name	Aquion RFIC
Detector SN	220360045
Data Path	ChromeleonLocal://Archemica/Service Contract/Validate 2024/1PM1PQ 23-04-24/Anion/IC OQ

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Reference Blank	25	0.265	0.053
High Standard	25	0.265	49.734
Carryover	25	0.265	0.051

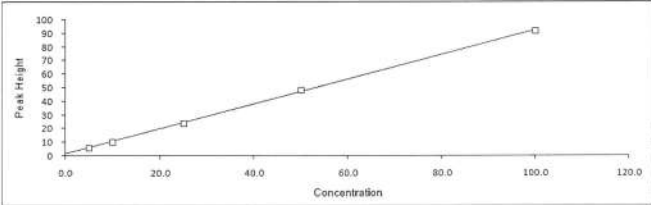
Results

Test	Observed (%)	OQ Limit (%)	Result
AREA	0.00	≤ 0.10	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Rattanaporn</i>	<i>Surin</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม



Information

System Name	Aquion RFIC
Detector SN	220360045
Data Path	ChromeleonLocal://Archemica/Service Contract/Validate 2024/1PM1PQ 23-04-24/Anion/IC OQ

Peak Results

Sample Name	Concentration	Peak Height	Calculated
Detector Linearity 01	5	5.872	4.82
Detector Linearity 02	10	10.299	9.68
Detector Linearity 03	25	23.794	24.52
Detector Linearity 04	50	48.473	51.65
Detector Linearity 05	100	91.855	99.34

Linearity

Test	Observed	OQ Limit	Result
r ²	0.999	≥ 0.999	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Rattanaporn</i>	<i>Surin</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

EG Current Test

Set Point (mM)	Expected (mA)	Reading (mA)	Deviation (mA)	OQ Limit (mA)	Result
1.00	1.6082	1.604	0.00	± 0.01	PASS
5.00	8.041	8.019	0.02	± 0.05	PASS
10.00	16.082	16.037	0.05	± 0.10	PASS
50.00	80.41	80.17	0.24	± 0.50	PASS
100.00	160.82	160.32	0.50	± 1.00	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>K. Rattanaporn</i>	<i>Surin</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

IC Pump Flow Rate

Set Point (mL) (mL/min)	Reading (mL/min)	Deviation (%)	OQ Limit (%)	Result
0.5	0.4995	0.100	± 2.0	PASS
1.0	0.999	0.10	± 2.0	PASS

OVERALL TEST RESULT: PASS



Field Service Representative Signature:	Customer Signature:
<i>K. Khamwong</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

OQ EXCEPTIONS AND COMMENTS

N/A

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Field Service Representative Signature:	Customer Signature:
<i>K. Khamwong</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

Column Compartment

Set Point (°C)	Reading (°C)	Deviation (°C)	OQ Limit (°C)	Result
30.0	30.5	0.5	± 2.0	PASS

OVERALL TEST RESULT: PASS



Field Service Representative Signature:	Customer Signature:
<i>K. Khamwong</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม

OQ REVIEW AND COMPLETION

These Operational Qualification Results should be reviewed by the Customer. If the qualification is accepted, both the Customer and the Service Representative should sign the Operational Qualification Results, below.

OPERATIONAL QUALIFICATION RESULTS

Based upon the actual results obtained, this Operational Qualification **PASSED** the acceptance criteria described in the Operational Qualification in the Installation Checklist procedure.

Service Representative

A Field Service Representative signature below confirms the completion of all aspects of the Operational Qualification and have concluded that the system has been successfully verified to be operating as required.

Customer

A Customer signature below confirms the completion of all aspects of the Operational Qualification have been completed and that the system has been successfully verified to be operating as required.



Field Service Representative Signature:	Customer Signature:
<i>K. Khamwong</i>	<i>Simon</i>
Date: 23/Apr/2024	Date: 23/Apr/2024

เอกสารไม่ควบคุม