

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือ



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									
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร ส่วนต่อขยายสายสีลม - ส่วนต่อขยายสายสุขุมวิท									
1	Orifice Transfer Standard Calibrator	Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental,Inc.	TE-5025A 3383	Jiranatee Associates Co., Ltd.	COF-040-68	30 Sep 25	29 Sep 26	-
2	U-Tube Manometer	Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P3508	9 Sep 25	8 Sep 26	-
3	Aneroid Barometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26P1516	22 Apr 26	21 Apr 27	-
4	Dial Thermo-Hygrometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26H708	17 Apr 26	16 Apr 27	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM08130002	UAE Consultant Co.,Ltd.	17022026	17 Feb 26	16 Feb 27	-
6	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
7	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1180540068	UAE Consultant Co.,Ltd.	11072025	11 Jul 25	10 Jul 26	-
8	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
9	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	LSI 17037708	Thai Meteorological Department	395/25	22 Aug 25	21 Aug 26	-
10	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11230	Calibration Laboratory Co.Ltd	Q25149760	23 Dec 25	22 Dec 26	-
11	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6855	Innovative Instrument Co.,Ltd.	25-ACT-137	9 Sep 25	8 Sep 26	-
12	Sound Level Meter	L _{Aeq} 24 hr, L _{Aeq} 1 hr, L _{Amax} , L _{A90} 5 min	Larson Davis	LxT2 0005403	Innovative Instrument Co.,Ltd.	25-SLM-246	30 Jul 25	29 Jul 27	-

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Ambient									
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร ส่วนต่อขยายสายสีลม (ถนนตากสิน-บางโพธิ์)									
1	Orifice Transfer Standard Calibrator	Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental,Inc.	TE-5025A 3540	Jiranatee Associates Co., Ltd.	COF-045-68	30 Oct 25	29 Oct 26	-
2	U-Tube Manometer	Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P3505	9 Sep 25	8 Sep 26	-
3	Aneroid Barometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26P1518	22 Apr 26	21 Apr 27	-
4	Dial Thermo-Hygrometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26H710	17 Apr 26	16 Apr 27	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050148	UAE Consultant Co.,Ltd.	20022026	20 Feb 26	19 Feb 27	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050149	UAE Consultant Co.,Ltd.	24022026	24 Feb 26	23 Feb 27	-
7	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
8	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i CM08140003	UAE Consultant Co.,Ltd.	04072025	4 Jul 25	3 Jul 26	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i CM08140004	UAE Consultant Co.,Ltd.	04072025	4 Jul 25	3 Jul 26	-
10	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
11	Wind Speed/Wind Direction	WS/WD	LSI Lastem	E-LOG 305 / DNA 821 20020305 / 20040161	Thai Meteorological Department	226/26	17 Apr 26	16 Apr 27	-
12	Wind Speed/Wind Direction	WS/WD	LSI Lastem	E-LOG 305 / DNA 821 20040002 / 20040162	Thai Meteorological Department	232/26	22 Apr 26	21 Apr 27	-
13	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11229	Calibration Laboratory Co.Ltd	Q25084761	19 Jul 25	18 Jul 26	-

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									
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร ส่วนต่อขยายสายสีลม (ถนนตากสิน-บางหว้า)									
14	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11355	Calibration Laboratory Co.,Ltd	Q25088636	1 Aug 25	31 Jul 26	-
15	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6695	Innovative Instrument Co.,Ltd.	25-ACT-135	9 Sep 25	8 Sep 26	-
16	Sound Level Meter	$L_{Aeq, 24 hr}$ $L_{Aeq, 1 hr}$ L_{Amax} $L_{A90, 5 min}$	Larson Davis	LxT2 0005286	Innovative Instrument Co.,Ltd.	25-SLM-272	11 Aug 25	10 Aug 27	-
17	Sound Level Meter	$L_{Aeq, 24 hr}$ $L_{Aeq, 1 hr}$ L_{Amax} $L_{A90, 5 min}$	Larson Davis	LxT2 0005287	Innovative Instrument Co.,Ltd.	25-SLM-241	29 Jul 25	28 Jul 27	-

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									
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร ส่วนต่อขยายสายสุขุมวิท (อ่อนนุช-แบริ่ง)									
1	Orifice Transfer Standard Calibrator	Particulate Matter < 10 μm (PM ₁₀)	Thermo Scientific	G25A 158M	Jiranatee Associates Co., Ltd.	COF-025-68	21 Jul 25	20 Jul 26	-
2	U-Tube Manometer	Particulate Matter < 10 μm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P3507	9 Sep 25	8 Sep 26	-
3	Aneroid Barometer	Particulate Matter < 10 μm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26P1523	23 Apr 26	22 Apr 27	-
4	Dial Thermo-Hygrometer	Particulate Matter < 10 μm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	26H712	17 Apr 26	16 Apr 27	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920006	UAE Consultant Co.,Ltd.	17022026	17 Feb 26	16 Feb 27	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920009	UAE Consultant Co.,Ltd.	20022025	20 Feb 26	19 Feb 27	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778106	UAE Consultant Co.,Ltd.	24022026	24 Feb 26	23 Feb 27	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497732	UAE Consultant Co.,Ltd.	02032026	2 Mar 26	1 Mar 27	-
10	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497733	UAE Consultant Co.,Ltd.	17072025	17 Jul 25	16 Jul 26	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778117	UAE Consultant Co.,Ltd.	11072025	11 Jul 25	10 Jul 26	-
12	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jul 23	6 Jul 31	-
13	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2205070105	Thai Meteorological Department	133/26	2 Mar 26	1 Mar 27	-

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									
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร ส่วนต่อขยายสายสุขุมวิท (อ่อนนุช-แบริ่ง)									
14	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2205DT0113	Thai Meteorological Department	033/26	20 Jan 26	19 Jan 27	-
15	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2205DT0114	Thai Meteorological Department	225/26	17 Apr 26	16 Apr 27	-
16	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14466	Calibration Laboratory Co.Ltd	Q25149757	23 Dec 25	22 Dec 26	-
17	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14468	Calibration Laboratory Co.Ltd	Q25084757	19 Jul 25	18 Jul 26	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14472	Calibration Laboratory Co.Ltd	Q25149759	22 Dec 25	21 Dec 26	-
19	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6695	Innovative Instrument Co.,Ltd.	25-ACT-135	9 Sep 25	8 Sep 26	-
20	Sound Level Meter	$L_{Aeq} 24 hr$, $L_{Aeq} 1 hr$, L_{Amax} , $L_{A90} 5 min$	Larson Davis	LxT2 0005288	Innovative Instrument Co.,Ltd.	25-SLM-242	29 Jul 25	28 Jul 27	-
21	Sound Level Meter	$L_{Aeq} 24 hr$, $L_{Aeq} 1 hr$, L_{Amax} , $L_{A90} 5 min$	Larson Davis	LxT2 0005296	Innovative Instrument Co.,Ltd.	26-SLM-165	23 Apr 26	22 Apr 28	-
22	Sound Level Meter	$L_{Aeq} 24 hr$, $L_{Aeq} 1 hr$, L_{Amax} , $L_{A90} 5 min$	Larson Davis	LxT2 0005298	Electrical And Electronics Institute Foundation For Industrial Development	CP20240341EA	23 Sep 24	22 Sep 26	-



Jirananatee Associates Co.,Ltd.
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Bangkok 10600 (Thailand)
Tel: +662-0888411
Mobile: +662-0888413
E-mail: jiracalibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department.



Continuation of Certificate of Calibration Number CDF-040-68

Page 2 of 2 Pages

CERTIFICATE OF CALIBRATION

Certificate No.: CDF-040-68

Page 3 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

Tag Used Office:
TISCH
TE-5025A
1388
USE: IFM 063/2560
Used item
United Analyst and Engineering Consultant Co., Ltd.
81 Sor Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanung,
Bangkok 10250

Calibration procedure:
The Orifice gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots Meter)
Model GGS/WC/W9-60. The ggc-004
was used as a calibration guide.

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 NMVT (National
Metrology Institute of Thailand) via Certificate
number MMT0314-25.

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'.

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

28 Aug 2025
29 Sep 2025
30 Sep 2025

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 : 1020 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.2 °C and 55.9 %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.

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 [Tg] °C	Temperature [Tm] °C	A_p , meter mmHg	A_p , Orifice mmHg	F	Standard Flow [Q_s] m^3/min
1	0.704	753.311	22.97	22.08	56.534	1.512	1.228	0.652
2	1.001	753.266	22.99	22.37	62.413	3.014	1.734	0.918
3	1.135	753.254	23.08	22.48	41.501	3.969	1.990	1.054
4	1.184	753.258	23.09	22.55	29.909	4.424	2.151	1.117
5	1.433	753.191	23.04	22.66	28.108	6.537	2.554	1.358

Slope (a): 1.87953
Intercept (b): 0.00567
Correlation coefficient (r): 0.99982
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Tg] °C	Temperature [Tm] °C	A_p , meter mmHg	A_p , Orifice mmHg	F	Standard Flow [Q_s] m^3/min
1	0.704	753.311	22.97	22.08	56.534	1.512	0.771	0.653
2	1.001	753.266	22.99	22.37	62.413	3.014	1.286	0.920
3	1.135	753.254	23.08	22.48	41.501	3.969	1.249	1.056
4	1.184	753.258	23.09	22.55	29.909	4.424	1.319	1.120
5	1.433	753.191	23.04	22.66	28.108	6.537	1.609	1.359

Slope (a): 1.17726
Intercept (b): 0.00356
Correlation coefficient (r): 0.99982
Uncertainty (k=2): 0.015 m^3/min

End of Certificate of Calibration

Calibrated by:
☐ Mr. Somchai Thachalad
☒ Ms. Jirananatee Lertmahitphol



Approved signature: Mr. Panyee Booncharoen
Calibration Department Manager





Certificate of Calibration

Certificate No.: 25P3508
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-WM
Serial No.: -
ID No.: UAE.EFM.180/2561

Condition As-Received: Used Item
Received Date: 03 September 2025
Calibration Date: 09 September 2025

Reference: 2509-0144WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1006 mbar

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

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

Procedure used: 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-0218-24	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 inHg

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 measurement result is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSIC Accredited No. Calibration 0144



Cert.No.: 25P3508
Page: 2 of 2

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

Range: 0 inHg to 36 inHg
Scale Interval: 0.1 inHg (The Second Estimate)

Applied Pressure	High-port side	UUC Indication		ΔP	Error
		Low-port side	Low-port side		
0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.95	-0.95	1.90	-1.10	-1.10
4.00	1.95	-1.95	3.90	-1.10	-1.10
6.00	2.95	-3.00	5.95	-0.05	-0.05
8.00	3.95	-4.00	7.95	-0.05	-0.05
10.00	4.95	-5.00	9.95	-0.05	-0.05
12.00	6.00	-6.00	12.00	0.00	0.00
14.00	7.00	-7.00	14.00	0.00	0.00
16.00	8.00	-8.00	16.00	0.00	0.00
18.00	9.00	-9.00	18.00	0.00	0.00
20.00	10.00	-10.00	20.00	0.05	0.05
22.00	11.00	-11.05	22.05	0.05	0.05
24.00	12.00	-12.05	24.05	0.05	0.05
26.00	13.00	-13.05	26.05	0.05	0.05
28.00	14.00	-14.10	28.10	0.10	0.10
30.00	15.00	-15.10	30.10	0.10	0.10
32.00	16.05	-16.10	32.15	0.15	0.15
34.00	17.05	-17.10	34.15	0.15	0.15
36.00	18.00	-18.00	36.00	0.10	0.10

The uncertainty of measurement was ± 0.11 inHg

* 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 %.

-00-

Calibrated by: Suksan Khankeaw
Issue Date: 10 September 2025

Approved Signatory: Ahapol P

[] Phalinee Pratsapal
[] Sura Suwanmanee
[✓] Attapol Panurath

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 26P1518
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.120/2550

Condition As-Received: Used Item
Received Date: 19 April 2026
Calibration Date: 22 April 2026

Reference: 2604-0316WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %

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

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) Pressure Indicator	DPI142	142205046	MP-0150-25	20 May 2026

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

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

4. This measurement result is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Technical information and UUC* settings during calibration:

Result of calibration: Without adjustment
Pressure type: Absolute Pressure
Installation: Vertical Orientation
Atmospheric pressure: (1004 ± 10) mbar
Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)
Pressure medium: Clean air
Reference level: at the center of the dial

Increasing Pressure

Applied Pressure (hPa)	960.73	971.51	982.09	991.61	1000.93	1009.79	1019.03	1028.51
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	-0.73	-1.51	-2.00	-1.61	-0.93	0.25	0.97	1.49

Decreasing Pressure

Applied Pressure (hPa)	1028.45	1018.52	1008.58	999.64	990.31	981.35	970.50	960.47
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	1.55	1.48	1.42	0.36	-0.31	-1.35	-0.50	-0.47

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 %.

-00-

Calibrated by: Sontichai Chaitan
Issue Date: 24 April 2026

Approved Signatory: S Sura

[] Phalinee Pratsapal
[✓] Sura Suwanmanee
[] Attapol Panurath

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9434



Certificate of Calibration

Certificate No.: 26H708
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.016/2547

Condition As-Received: Used Item
Received Date: 10 April 2026
Calibration Date: 17 April 2026
Reference: 2604-0315WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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

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

Procedure used: Calibration were conducted using in-house calibration procedure CP402 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	41292	23277	08 May 2026
2) Handheld Thermometer With Sensor	1523	5717086	251200	21 Nov 2026

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

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

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200592-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Result of Calibration:- Before Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	UUC* Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	39	1.1	1.6
25.0	60.0	58	2.0	1.7
25.0	80.0	75	5.0	1.9

Result of Calibration:- After Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	UUC* Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	0.1	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	77	3.0	1.9

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

Standard Temperature (°C)	UUC* Reading (°C)	UUC* Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.0	0.012	0.65
25.028	25.0	0.028	0.65
30.005	30.0	0.005	0.65
35.019	35.0	0.019	0.65
40.040	39.5	0.540	0.65

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%.

Calibrated by: Kraisop Onrat
Issue Date: 23 April 2026

Approved Signatory:

[] Chakrit Wawwanjui
[] Pornthipha Taneyakul
[✓] Vipom Tanliyawuti

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เอกสารไม่ควบคุม



United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

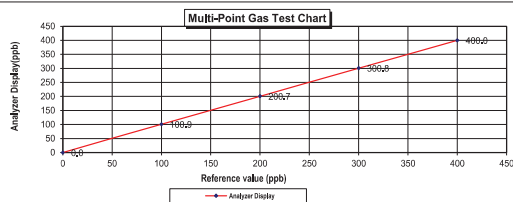
Test Date: Feb 17, 2026

Equipment: Gas Analyzer (NO₂)
Manufacturer: Thermo Scientific
Model: 421
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	0.00	0.00	0.00
Level 2 20.00%	100.0	0.90	0.89	0.89
Level 3 40.00%	200.0	0.70	0.35	0.35
Level 4 60.00%	300.0	0.80	0.27	0.27
Level 5 80.00%	400.0	0.00	0.00	0.00
Remark: Measuring Range	500.0 ppb	Average Difference (%)	0.30	
Acceptable Limit ± 5%				



Calculate by

.....17.../...02.../...2569.

Approve by

.....17.../...Feb.../...2026.

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Airgas Specialty Gases
Airgas USA LLC
6442 Raritan Road
Florham Park, NJ 07931
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
Part Number: LTD
Cylinder Number: E05N191E15A0014
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO2, NO, NOX, SO2, BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Expiration Date: Jul 06, 2023

Certification performed in accordance with EPA Traceability Protocol for Analytical and Certification of Gaseous Calibration Standards (May 2012) document EPA 820-R-12-001, using the assay procedures listed. Analytical Metrology does not require correction for analytical interference. This cylinder has a full 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 fraction basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced without the full written 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
NO ₂	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	2000.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
DMIS	104282308	CC754384	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
DMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D813880	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
DMIS	153400303022	E00130007	9.993 PPM NITROGEN DIOXIDE/AIR	+/- 1.9%	Sep 29, 2023
NTRM	150101-02	KAL003820	87.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745602	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130605-02	CC411730	13.399 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

The DMIS, NTRM, PRM, or RGM listed above is only in reference to the DMIS used in the assay and not part of the analysis.

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet (550 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-CB-180	NDR	Jun 14, 2023
Nicolet (550 FTIR AUP2010245 NO2	FTIR	Jun 29, 2023
Nicolet (550 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023
Nicolet (550 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

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MULTI-POINT GAS TEST REPORT

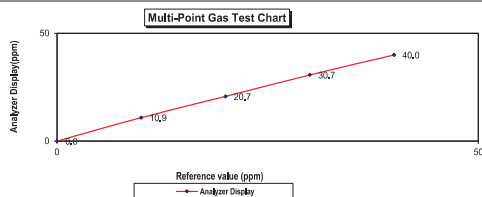
Test Date : July 11, 2025

Equipment : Gas Analyzer (CO) Model : 481
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540068

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	42.89 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77 PPM	Model :	1461
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9 PPM		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.9	0.9	8.3	8.3
Level 3	40.00%	20.0	20.7	0.7	3.4	3.4
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		2.78



Calculate by
Gordon E.
.....11.....07.....2568.

Approve by
P. P. P.
.....11.....July.....2025.

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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 : 22 August, 2025

Certification No. 395/25

Page : 1 of 7

Object : เครื่องมือตรวจวัดอุณหภูมิอากาศ

Manufacturer : LSI

Type : Data Logger : E-LOG 305 Wind speed : DNA202 Wind direction : DNA212
Thermometers : DMA672.1 Barometer : DQA 240.1

Mfg Code : Data Logger : 17037708 Wind speed : BQ1706626 Wind direction : 19020250
Thermometers : 24070679 Barometer : R1606260

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

81 Soi Udomsuk 41, Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260.

Calibration Condition : Temperature : 25.1 °C Barometric Pressure : 1009.9 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112

: Micromanometer : Theodor Friedrichs FQ214 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

: Thermoschneider No. 9188 : tests, tests 645 Serial No. 02849057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V12005

Calibrated by : H. P. P.
Mr. Watchapol Subwat

Signed : P. P. P.
Mr. Pichon Pichon

Mechanical Engineer

Authorized Signatory
for the Chief
of Standard Instrument

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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 2 of 7

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer					
m/sec	inches H ₂ O	inches H ₂ O	ft/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.9	0.12
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.9	0.12

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

WIND DIRECTION		TESTED WIND DIRECTION	
0		0	
90		90	
180		180	
270		270	

Calibrated by : H. P. P.
Mr. Watchapol 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

Certification No. 395/25

22 August, 2025

Page : 3 of 7

Standard Barometer	Tested Barometer	Correction
	Pressure	Pressure
1009.20	1009.12	0.08
1009.04	1008.98	0.06
1008.82	1008.85	-0.03
1008.65	1008.72	-0.07
1008.46	1008.45	0.01
1008.19	1008.18	-0.03
1007.64	1007.52	0.12
1007.43	1007.38	0.05
1007.27	1007.25	0.02
1007.04	1006.96	0.08
1006.43	1006.45	-0.02
1006.21	1006.32	-0.11
1006.62	1006.58	0.04
1006.41	1006.32	0.09
1006.09	1006.05	0.04
1007.58	1007.52	0.06
1007.32	1007.25	0.07
1007.12	1006.98	0.14
1006.84	1006.65	-0.01
1006.28	1006.32	-0.04

Average

Calibrated by : H. P. P.
Mr. Watchapol 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

Certification No. 395/25

22 August, 2025

Page : 4 of 7

Standard Barometer Pressure	Tested Barometer Pressure	Correction
756.96	756.9	0.06
756.84	756.8	0.04
756.68	756.7	-0.02
756.55	756.6	-0.05
756.41	756.4	0.01
756.17	756.2	-0.03
755.79	755.7	0.09
755.63	755.6	0.03
755.51	755.5	0.01
755.34	755.3	0.04
754.88	754.9	-0.02
754.72	754.8	-0.08
756.53	756.5	0.03
756.37	756.3	0.07
756.13	756.1	0.03
755.75	755.7	0.05
755.55	755.5	0.05
755.40	755.3	0.10
755.19	755.2	-0.01
754.77	754.8	-0.03

Average

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



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THAI METEOROLOGICAL DEPARTMENT

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The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 5 of 7

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.14	45.24	-0.10
30.25	30.34	-0.09
15.24	15.29	-0.05

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



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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 395/25

22 August, 2025

Page : 6 of 7

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
95.53	97.1	-1.57
65.24	66.1	-0.86
44.12	44.5	-0.38

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



เอกสารไม่ควบคุม



Date of Issue 22 August, 2025

Certification No. 395/25

Page : 7 of 7

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ LSI LASTEM แบบ TIPPING BUCKET
Code. DQA230.1#C Serial No. PC1705209 ที่ทำการสอบเทียบกับแก้ววัดฝนแบบแก้วควง
GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และ
สามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ *วิมล งามวิวัฒน์*
(นายวิมล งามวิวัฒน์)
วิศวกรชำนาญการ

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230[UAE.EFM.029/2559]
CLID. NO. : 251701315
JOB CONTROL NO. : 2512221-49760
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 22 December 2025

DATE OF ISSUED : 25 December 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
25 December 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25149760
F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230[UAE.EFM.029/2559]
DATE OF CALIBRATION : 23 December 2025

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter and Vibration Calibrator with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0090-25, Due Date 31 July 2026.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 22 July 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25149760
F3-011-05/12-23

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CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	$\pm$ (% of rdg.)
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.6
0.5	50 Hz		0.500	0.507	-0.007	1.6
0.6	50 Hz		0.600	0.608	-0.008	2.5
0.7	50 Hz		0.700	0.710	-0.010	2.5
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.6
0.5	100 Hz		0.500	0.506	-0.006	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	$\pm$ (% of rdg.)
3	50 Hz	peak	3.000	3.029	-0.029	1.8
4	50 Hz		4.000	4.038	-0.038	1.8
5	50 Hz		5.000	5.067	-0.067	1.8
6	50 Hz		6.000	6.076	-0.076	1.8
7	50 Hz		7.000	7.089	-0.089	1.8
3	100 Hz	peak	3.000	3.029	-0.029	1.6
4	100 Hz		4.000	4.039	-0.039	1.6
5	100 Hz		5.000	5.045	-0.045	1.6
6	100 Hz		6.000	6.059	-0.059	1.5
7	100 Hz		7.000	7.068	-0.068	1.5

Certificate No. Q25149760
F3-011-05/12-23

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	$\pm$ (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 1.2 of 73.

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q25149760
F3-011-05/12-23

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Certificate of Calibration

Customer

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

Certificate No : 25-ACT-137
Request No : Req-2025-1828

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6855
ID : UAAEPM.046/2566

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 7 August 2025
Calibration Date : 9 September 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	20 June 2026
THD Multimeter	2015	104765	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 Luangert
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 9 September 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-ACT-02 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-ACT-137
Request No : Req-2025-1828

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	93.81	-0.19	-	-	0.11
114 dB / 1000 Hz	113.94	-0.06	-	-	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	1000.00	0.00	-	-	0.01
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)
	Measured (%)	Measured (%)	
94 dB / 1000 Hz	1.18	-	0.17
114 dB / 1000 Hz	0.63	-	0.17

Note :

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

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-ACT-02 Rev.06 Issue date 17/2/25

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Certificate of Calibration

Customer

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

Certificate No : 25-SLM-246
Request No : Req-2025-1638

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LA12 Microphone S/N : 335074
Serial Number : 0005403 Preamplifier Model : PRMLX12C
ID : UAAEPM.038/2564 Preamplifier S/N : 071570
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 : 16 July 2025
Calibrated Date : 30 July 2025

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multifunction Acoustic Calibrator	Brouck/Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	Svantek	Svan401	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 Luangert
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 30 July 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-708-06-SM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-246
Request No : Req-2025-1638

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)
1000 Hz 114 dB	114.68	115.0	0.32	114.7	0.02	0.20

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-100, S/N: AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	29.6	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	29.4	0.10
C	29.0	0.10
Z	33.3	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A (dB)	C (dB)	Z (dB)	
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)
STD Setting	0.1	0.2	0.1	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	1.2	1.3	1.2	0.60
8000 Hz	2.0	2.1	2.1	0.70

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-708-06-SM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-246
Request No : Req-2025-1638

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

Electrical signal test or frequency weightings, weighting network response with fast					
UUC Setting		Deviation from various Frequency			UNCERTAINTY
FAST / 37-139		Weighting Response curve			
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	
63 Hz	-0.2	0.0	0.0	0.20	
125 Hz	-0.1	0.0	0.0		
250 Hz	-0.1	0.0	0.0		
500 Hz	-0.1	0.0	0.0		
1000 Hz	0.0	0.0	0.0		
2000 Hz	0.0	0.0	0.0		
4000 Hz	0.0	0.0	0.0		
8000 Hz	-0.1	-0.1	0.0		
16000 Hz	-0.1	-0.1	-0.1		

6. Frequency and time weightings at 1kHz

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

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
37-139 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	0.20
Fast	114.00	114.0	0.0	
Slow	114.00	114.0	0.0	
Log	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.
FSM-708-SLM-01 Rev.09 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-246
Request No : Req-2025-1638

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)
FAST / A / 37-139	REF	UUC	ERR	
STD dB	(dB)	(dB)	(dB)	0.30
139.00	139	138.9	-0.1	
134.00	134	133.9	-0.1	
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	98.9	-0.1	
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	44.1	0.1	
39.00	39	39.5	0.5	

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.09 Issue date 17/2/25

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Certificate No : 25-SLM-246
Request No : Req-2025-1638

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	0.30
37-139	44.70	44.8	0.1	
	114	114.0	0.0	

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)
A / 37-139	Timeburst	Ref	UUC	ERR	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.20
Fast	200	135.0	135.0	0.0	
	2	118.0	117.8	-0.2	
	0.25	109.0	108.7	-0.3	
Slow	200	128.6	128.5	-0.1	
	2	109.0	108.8	-0.2	
	200	129.0	129.0	0.0	
SEL	2	109.0	109.0	0.0	
	0.25	100.0	99.9	-0.1	

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)
FAST / C / 95-142	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	0.20
Complete cycle	137.4	136.6	-0.80	
Positive half cycle	136.4	136.2	-0.20	
Negative half cycle	136.4	136.2	-0.20	

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.09 Issue date 17/2/25

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Certificate No : 25-SLM-246
Request No : Req-2025-1638

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / A / 37-139	UUC	
STD Setting	(dB)	0.20
Positive one-half cycle	143.4	
Negative one-half cycle	143.5	
Deviated	-0.1	

13. High Level Stability

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

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FSM-708-SLM-01 Rev.09 Issue date 17/2/25

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CERTIFICATE OF CALIBRATION

Certificate No. : COF-045-68

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

: Top Load Office:
: TSCN
: TE-5025A
: 3540
: UAE.EFM.176/2561
: Used Item
: United Analyst and Engineering Consultant Co., Ltd.
: 81 Soi Udomrak 41, Sukhumvit Road, Bangkok, Phrakhanong,
: Bangkok 10260

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

Traceability:
This certificate provides a traceability of the measurement to realization of the national standards, and to realization of the international system of units (SI) through the NMV (National Metrology Institute of Thailand) via Certificate number: NMV-0015-25.

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".

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 20 Oct 2025
: 30 Oct 2025
: 30 Oct 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 0.5 °C
Relative Humidity : 55.0 ± 13.0 %RH
Atmospheric Pressure : 1030 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.2 °C and 48.3 %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.

Calibrated by:

☐ Mr. Torayit Thachad
☒ Miss Jiraporn Lertsomphol



Approved signatory

Mr. Parinya Booncharoen
Calibration Department Manager

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

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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 $[\text{Pa}]$ mmHg	Temperature $[\text{T}_a]$ °C	Temperature $[\text{T}_m]$ °C	A_{p_meter} mmHg	$A_{p_Orifice}$ InH ₂ O	γ	Standard Flow $[\text{Q}_s]$ m^3/min
1	0.701	758.426	23.16	22.28	57.504	1.637	1.282	0.653
2	1.002	758.497	23.31	22.57	61.950	3.314	1.824	0.926
3	1.115	758.592	23.34	22.66	41.295	4.360	2.092	1.061
4	1.163	758.673	23.42	22.87	30.200	4.879	2.213	1.122
5	1.433	758.682	23.67	23.13	29.302	7.272	2.700	1.364

Slope (m): 1.99178
Intercept (b): -0.01980
Correlation coefficient (r): 0.99980
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure $[\text{Pa}]$ mmHg	Temperature $[\text{T}_a]$ °C	Temperature $[\text{T}_m]$ °C	A_{p_meter} mmHg	$A_{p_Orifice}$ InH ₂ O	γ	Standard Flow $[\text{Q}_s]$ m^3/min
1	0.701	758.426	23.16	22.28	57.504	1.637	0.800	0.650
2	1.002	758.497	23.31	22.57	61.950	3.314	1.138	0.922
3	1.115	758.592	23.34	22.66	41.295	4.360	1.385	1.057
4	1.163	758.673	23.42	22.87	30.200	4.879	1.381	1.118
5	1.433	758.682	23.67	23.13	29.302	7.272	1.687	1.361

Slope (m): 1.24752
Intercept (b): -0.01234
Correlation coefficient (r): 0.99989
Uncertainty (k=2): 0.015 m^3/min

End of Certificate of Calibration



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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
3144 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10251
TEL: 0-2715-5009/54 FAX: 0-2719-1488

Certificate of Calibration

Certificate No. : 25P3505
Page : 1 of 2

Equipment : U-Tube Manometer
Manufacturer : Dwyer
Model : 1221-36-W/M
Serial No. : -
ID No. : UAE.EFM.020/2560

Condition As-Received: Used Item

Received Date: 03 September 2025
Calibration Date: 09 September 2025

Reference: 2508-Q144/WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1010 mbar

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

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

81 Soi Udomrak 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 guideline.

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 $1\text{ kPa} = 4.0146293\text{ InH}_2\text{O}$

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

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

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

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

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

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144



Cert.No.: 25P3505
Page: 2 of 2

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

Range: 0 InH₂O to 36 InH₂O
Scale Interval: 0.1 InH₂O (The Second Estimate)

Applied Pressure	High-port side	Low-port side	Δp	Error
0.00	0.00	0.00	0.00	0.00
2.00	0.96	-1.05	2.00	0.00
4.00	1.96	-2.05	4.00	0.00
6.00	2.96	-3.05	6.00	0.00
8.00	3.96	-4.05	8.00	0.00
10.00	4.96	-5.05	10.00	0.00
12.00	5.96	-6.05	12.00	0.00
14.00	6.96	-7.05	14.00	0.00
16.00	7.96	-8.05	16.00	0.00
18.00	8.96	-9.10	18.10	0.10
20.00	10.00	-10.10	20.10	0.10
22.00	11.06	-11.10	22.16	0.16
24.00	12.06	-12.10	24.16	0.16
26.00	13.06	-13.10	26.16	0.16
28.00	14.06	-14.10	28.16	0.16
30.00	15.06	-15.05	30.10	0.10
32.00	16.10	-16.05	32.15	0.15
34.00	17.10	-17.05	34.15	0.15
36.70	18.00	-17.90	35.90	0.20

The uncertainty of measurement was $\pm 0.11\text{ InH}_2\text{O}$

* Δp = High-port side - Low-port side

* LUUC = 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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Calibrated by : Suksan Khankaw
Issue Date : 10 September 2025

Approved Signatory :

AHappi P
[] Phalinee Prabpai
[] Sura Suwananai
[] Atitad Panurath

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Certificate of Calibration

Certificate No.: 26P1518
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE/ANV.122/2550

Condition As-Received: Used Item

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Received Date: 10 April 2026
Calibration Date: 22 April 2026

Reference: 2604-0316WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

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) Pressure Indicator	DP142	1422505046	MP-0150-25	20 May 2026
2. This result of calibration was made on requested at the point specified by customer.				
3. The certificate is valid only to the item calibrated on date and place of calibration.				
4. This measurement result is traceable to the International System of Unit maintained through:-				
-National Institute of Metrology Thailand (NIMT)				

Technical information and UUC* settings during calibration:

Result of calibration : Without adjustment
Pressure type : Absolute Pressure
Installation : Vertical Orientation
Atmospheric pressure : (1004 ± 10) mbar
Range : 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)
Pressure medium : Clean air
Reference level : at the center of the dial

Increasing Pressure

Applied Pressure (hPa)	956.08	967.55	978.80	989.27	999.15	1009.73	1019.21	1027.85
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	3.94	2.45	1.20	0.73	0.85	1.27	1.76	2.15

Decreasing Pressure

Applied Pressure (hPa)	1027.88	1018.05	1008.76	999.09	989.30	978.71	967.19	955.90
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	2.12	1.95	1.24	0.91	0.70	1.29	2.81	4.10

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 %.

-000-

Calibrated by : Somchai Chaichan
Issue Date : 24 April 2026

Approved Signatory :

[] Phaiwan Pratsapalai
[✓] Sura Suwananari
[] Attapol Panurach

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Certificate of Calibration

Certificate No.: 26H710
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE/ANV.004/2548

Condition As-Received: Used Item

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Received Date: 10 April 2026
Calibration Date: 17 April 2026
to 22 April 2026

Reference: 2604-0315WSC

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	Dev Master	41292	23277	08 May 2026
2) Handheld Thermoanemometer With Sensor	1523	5717096	251200	21 Nov 2026

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

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

- Thunder Scientific Corporation, NVLAP Accreditation No. Calibration 200562-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSAC Accredited No. Calibration 0008

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

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	UUC* Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	0.1	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	2.0	1.9

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

Standard Temperature (°C)	UUC* Reading (°C)	UUC* Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.5	-0.488	0.65
25.028	25.0	0.028	0.65
30.005	30.0	0.005	0.65
35.019	35.0	0.019	0.65
40.040	39.5	0.540	0.65

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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Calibrated by : Krapop Onsil
Issue Date : 25 April 2026

Approved Signatory :

[] Chakrit Wawerwajue
[] Pornthippa Tameyakul
[✓] Vipom Tantiyawutti

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MULTI-POINT GAS TEST REPORT

Test Date : Feb 20, 2026

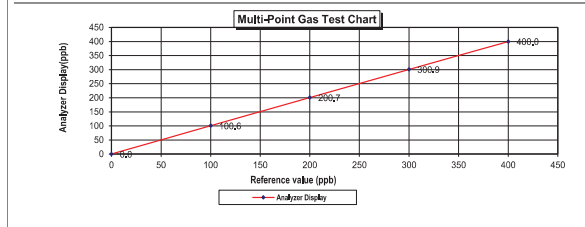
Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

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 PPM		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 6, 2026		

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	0.60	0.60	0.79
Level 3	40.00%	200.7	0.70	0.35	0.94
Level 4	60.00%	300.9	0.90	0.30	0.13
Level 5	80.00%	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb Average Difference (%) 0.25
:Acceptable Limit $\pm$ 5%



Calculate by : *[Signature]* 20 / 02 / 2569
Approve by : *[Signature]* 20 / Feb / 2026

MULTI-POINT GAS TEST REPORT

Test Date : Feb 24, 2026

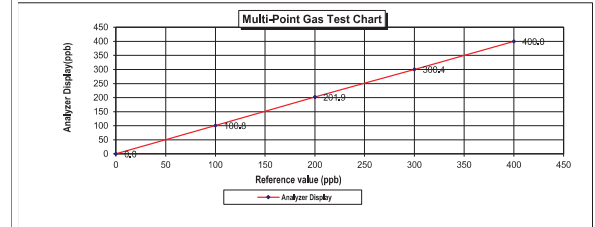
Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050149

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 PPM		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	0.80	0.79	0.79
Level 3	40.00%	201.9	1.90	0.94	0.94
Level 4	60.00%	300.4	0.40	0.13	0.13
Level 5	80.00%	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb Average Difference (%) 0.37
:Acceptable Limit $\pm$ 5%



Calculate by : *[Signature]* 24 / 02 / 2569
Approve by : *[Signature]* 24 / Feb / 2026

MULTI-POINT GAS TEST REPORT

Test Date : July 4, 2025

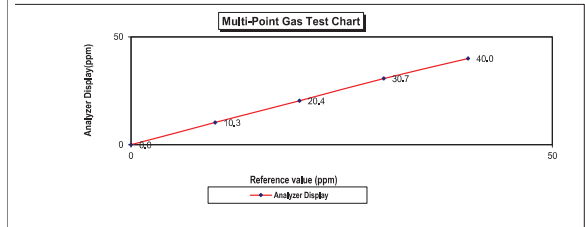
Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : CM08140003

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 PPM		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.3	2.9	2.9
Level 3	40.00%	20.0	20.4	0.4	2.0
Level 4	60.00%	30.0	30.7	2.3	2.3
Level 5	80.00%	40.0	0.0	0.0	0.0

Remark : Measuring Range 50.0 ppm Average Difference (%) 1.43
:Acceptable Limit $\pm$ 5%



Calculate by : *[Signature]* 4 / 07 / 2568
Approve by : *[Signature]* 4 / July / 2025

MULTI-POINT GAS TEST REPORT

Test Date : July 4, 2025

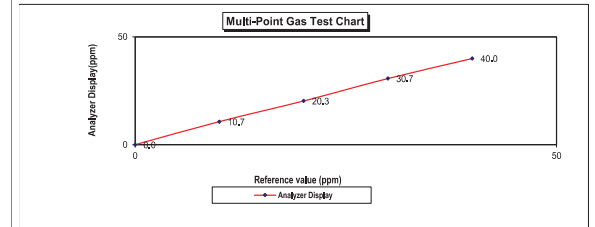
Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : CM08140004

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 PPM		
Cylinder No. :	EB01159156		
Expiration Date :	Nov 06, 2026		

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.7	6.5	6.5
Level 3	40.00%	20.0	20.3	0.3	1.5
Level 4	60.00%	30.0	30.7	0.7	2.3
Level 5	80.00%	40.0	0.0	0.0	0.0

Remark : Measuring Range 50.0 ppm Average Difference (%) 2.06
:Acceptable Limit $\pm$ 5%



Calculate by : *[Signature]* 4 / 07 / 2568
Approve by : *[Signature]* 4 / July / 2025

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 17 April, 2026

Certification No. 226/26

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI Lastem ID No. : UAE.EFM.119/2563

Type : Data Logger E-LOG 305 wind speed and wind direction DNA B21

Serial No. : Data Logger 20020305 wind speed and wind direction 20040161

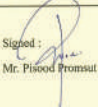
Customer : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

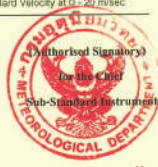
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023
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

Calibrated by :  Signed : 
Mr. Watcharapol Subwat Mr. Pigeod Promsit
Mechanical Engineer



เอกสารไม่ควบคุม

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

The Result of Calibration

Certification No. 226/26

17 April, 2026

Page : 2 of 2

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure m/sec	Vacuum m/sec	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
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



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 22 April, 2026

Certification No. 232/26

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI Lastem ID No. : UAE.EFM.120/2563

Type : Data Logger E-LOG 305 wind speed and wind direction DNA B21

Serial No. : Data Logger 20040002 wind speed and wind direction 20040162

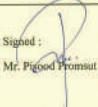
Customer : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.1 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023
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

Calibrated by :  Signed : 
Mr. Watcharapol Subwat Mr. Pigeod Promsit
Mechanical Engineer



เอกสารไม่ควบคุม

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

The Result of Calibration

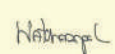
Certification No. 232/26

22 April, 2026

Page : 2 of 2

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure m/sec	Vacuum m/sec	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
11.01	-	-	-	11.0	0.01
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



เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11229/UM11229 [UAE.EFM.028/2559]
CLID. NO. : 251701314
JOB CONTROL NO. : 250719084761
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED : 24 July 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
24 July 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25084761

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11229/UM11229 [UAE.EFM.028/2559]
DATE OF CALIBRATION : 19 July 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter and Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Briel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25084761

F3-011-05/12-23

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.3
0.5	50 Hz		0.500	0.509	-0.009	1.3
0.6	50 Hz		0.600	0.610	-0.010	2.5
0.7	50 Hz		0.700	0.712	-0.012	2.5
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.405	-0.005	1.3
0.5	100 Hz		0.500	0.506	-0.006	1.3
0.6	100 Hz		0.600	0.607	-0.007	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.032	-0.032	1.8
4	50 Hz		4.000	4.046	-0.046	1.8
5	50 Hz		5.000	5.057	-0.057	1.8
6	50 Hz		6.000	6.068	-0.068	1.8
7	50 Hz		7.000	7.079	-0.079	1.8
3	100 Hz	peak	3.000	3.031	-0.031	2.7
4	100 Hz		4.000	4.044	-0.044	1.3
5	100 Hz		5.000	5.049	-0.049	1.3
6	100 Hz		6.000	6.057	-0.057	1.0
7	100 Hz		7.000	7.064	-0.064	1.0

Certificate No. Q25084761

F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.051	-0.001	1.4
0.06	50 Hz		0.060	0.061	-0.001	1.3
0.07	50 Hz		0.070	0.071	-0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.051	-0.001	1.4
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.1

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q25084761

F3-011-05/12-23

เอกสารไม่ควบคุม





CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
CLID. NO. : 252000637
JOB CONTROL NO. : 250730088636
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 30 July 2025

DATE OF ISSUED : 05 August 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

[Signature]



Approved By : Mongkol Yotsoontorn
Authorized Signatory
05 August 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25088636
F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
DATE OF CALIBRATION : 01 August 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Advanced Multimeter, Programmable Timer/Counter and Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Advanced Multimeter, Transmile Model 8104 S/N. N2164D24.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Transmile Ltd. Certificate No. 54742, Due Date 02 July 2026.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2022)"

Certificate No. Q25088636
F3-011-05/12-23

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point	Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g) (frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3 50 Hz	peak	0.300	0.297	+0.003	1.9
0.4 50 Hz		0.400	0.396	+0.004	1.6
0.5 50 Hz		0.500	0.494	+0.006	1.6
0.6 50 Hz		0.600	0.593	+0.007	2.5
0.7 50 Hz		0.700	0.693	+0.007	2.5
0.3 100 Hz		0.300	0.300	0.000	1.9
0.4 100 Hz	peak	0.400	0.399	+0.001	1.6
0.5 100 Hz		0.500	0.498	+0.002	1.6
0.6 100 Hz		0.600	0.597	+0.003	2.5
0.7 100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point	Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s) (frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3 50 Hz	peak	3.000	3.008	-0.008	1.8
4 50 Hz		4.000	4.018	-0.018	1.8
5 50 Hz		5.000	5.026	-0.026	1.8
6 50 Hz		6.000	6.032	-0.032	1.8
7 50 Hz		7.000	7.039	-0.039	1.8
3 100 Hz		3.000	3.008	-0.008	1.6
4 100 Hz	peak	4.000	4.014	-0.014	1.6
5 100 Hz		5.000	5.021	-0.021	1.6
6 100 Hz		6.000	6.028	-0.028	1.5
7 100 Hz		7.000	7.034	-0.034	1.5

Certificate No. Q25088636
F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point	Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm) (frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03 50 Hz	peak	0.030	0.030	0.000	2.5
0.04 50 Hz		0.040	0.040	0.000	2.1
0.05 50 Hz		0.050	0.050	0.000	1.9
0.06 50 Hz		0.060	0.060	0.000	1.8
0.07 50 Hz		0.070	0.069	+0.001	1.8
0.03 100 Hz		0.030	0.030	0.000	2.5
0.04 100 Hz	peak	0.040	0.040	0.000	2.1
0.05 100 Hz		0.050	0.050	0.000	1.9
0.06 100 Hz		0.060	0.060	0.000	1.8
0.07 100 Hz		0.070	0.069	+0.001	1.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q25088636
F3-011-05/12-23

เอกสารไม่ควบคุม



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-ACT-135
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260 Request No : Req-2025-1826

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB 1000Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6695
ID : UAE EFM.140/2565

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 7 August 2025
Calibration Date : 9 September 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	20 June 2026
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. Noppadol Lumgarn
Service Calibration Engineer

Approved By : Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 9 September 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Institute.
PM-708-ACT-02 Rev.04 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-ACT-135
Request No : Req-2025-1826

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)
	Measured	Deviated value	Measured	Deviated value	
94 dB / 1000 Hz	93.88	-0.12	-	-	0.11
114 dB / 1000 Hz	113.99	-0.01	-	-	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	1000.00	0.00	-	-	0.01
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (%)		Measured (%)		
94 dB / 1000 Hz	1.44		-		0.17
114 dB / 1000 Hz	0.67		-		0.17

Note :

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

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Institute.
PM-708-ACT-02 Rev.04 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-SLM-272
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260 Request No : Req-2025-1706

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LX72 Microphone S/N : 011740
Serial Number : 0005286 Pre-amplifier Model : PBML12B
ID : UAE EFM.102/2562 Pre-amplifier S/N : 056087
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 : 22 July 2025
Calibrated Date : 11 August 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
Multifunction Acoustic Calibrator	Briel&Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	SvanteK	Svan401	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. Noppadol Lumgarn
Service Calibration Engineer

Approved By : Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 11 August 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Institute.
PM-708-ELM-01 Rev.04 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272
Request No : Req-2025-1706

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust			After Adjust		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	ERR (dB)	UUC (dB)	ERR (dB)	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)
1000 Hz 114 dB	114.13	114.9	0.77	114.1	-0.03	0.20	

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 36, S/N. 107224

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.5	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.2	0.10
C	30.7	0.10
Z	35.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A	C	Z	
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)
STD Setting	0.2	0.2	0.2	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	1.6	1.7	1.7	0.60
8000 Hz	2.3	2.3	2.3	0.70

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Institute.
PM-708-ELM-01 Rev.04 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272
Request No : Req-2025-1706

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)
FAST / 37-139	A (dB)	C (dB)	Z (dB)	
STD Setting	(dB)	(dB)	(dB)	0.20
63 Hz	-0.2	0.0	0.0	
125 Hz	-0.1	0.0	0.0	
250 Hz	-0.1	0.0	0.0	
500 Hz	-0.1	0.0	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	0.0	0.0	0.0	
8000 Hz	0.0	0.0	0.0	
16000 Hz	-0.1	-0.1	-0.1	

6. Frequency and time weightings at 1kHz

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

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
37-139 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	0.20
Fast	114.00	114.0	0.0	
Slow	114.00	114.0	0.0	
Lin	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.

FSM-708-9L3M-01 Rev.08 Issue date 17/03/21

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272
Request No : Req-2025-1706

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)
FAST / A / 37-139	REF	UUC	ERR	
STD dB	(dB)	(dB)	(dB)	0.30
139.00	139	139.0	0.0	
134.00	134	134.0	0.0	
129.00	129	129.0	0.0	
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	49.1	0.1	
44.00	44	44.2	0.2	
43.00	43	43.3	0.3	
42.00	42	42.4	0.4	
41.00	41	41.5	0.5	

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-708-9L3M-01 Rev.08 Issue date 17/03/21

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272
Request No : Req-2025-1706

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	0.30
37-139	-6.60	46.7	0.1	
	114	114.0	0.0	

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)
A / 37-139	Timeburst	Ref	UUC	ERR	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.20
Fast	200	135.0	134.8	-0.1	
	2	118.0	117.8	-0.2	
	0.25	109.0	108.5	-0.5	
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	108.9	-0.1	
	0.25	100.0	99.8	-0.2	

11. Peak C Sound level

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

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-708-9L3M-01 Rev.08 Issue date 17/03/21

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272
Request No : Req-2025-1706

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / A / 37-139	UUC	
STD Setting	(dB)	0.20
Positive one-half cycle	145.5	
Negative one-half cycle	145.8	
Deviated	-0.1	

13. High Level Stability

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

End of Certificate

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

FSM-708-9L3M-01 Rev.08 Issue date 17/03/21

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-SLM-241
Request No : Req-2025-1240

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LX72
Serial Number : 0005287
ID : UAE-13M1032562
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : J50427
Preamplifier Model : PRML472H
Preamplifier S/N : 050074
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 : 16 July 2025
Calibrated Date : 29 July 2025
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electromagnetics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multi-function Acoustic Calibrator	Bruel&Kjaer	4256	3412381	8 May 2026	NIMT
Audio Generator	Svanick	Svan401	131	15 October 2025	WKC Electric

Note:

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor 4 ~ 2, providing a level of confidence approximately 95 %.

Calibrated By :
Mr. Noppakorn Luangrat
Service Calibration Engineer

Approved By :
Mr. Paet Mahavorn
Calibration Engineer Supervisor
Issue Date : 29 July 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.
Page: 1/6

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	After Adjust	UNCERTAINTY
FAST / A / 37-139	Level	UUC	ERR	UUC
Calibrator Setting	(dB)	(dB)	(dB)	(dB)
1000 Hz 114.0dB	114.68	115.2	0.52	114.7
			0.02	0.20

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN, AC-000001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	27.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	27.2	0.10
C	27.9	0.10
Z	34.6	0.10

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY
	Weighting Response curve			
FAST / 37-139	A	C	Z	(± dB)
STD Setting	(dB)	(dB)	(dB)	
125 Hz	0.4	0.3	0.3	
1000 Hz	0.0	0.0	0.0	
4000 Hz	0.1	0.1	0.1	
8000 Hz	-0.3	-0.3	-0.2	

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.
Page: 2/6

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY
FAST / 37-139	Weighting Response curve			
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)
63 Hz	0.2	0.2	0.2	0.20
125 Hz	0.1	0.2	0.2	
250 Hz	0.0	0.1	0.1	
500 Hz	0.0	0.1	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	-0.1	-0.1	-0.1	
8000 Hz	-0.2	-0.2	-0.1	
16000 Hz	-0.2	-0.2	-0.3	

6. Frequency and time weightings at 1kHz

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

UUC Setting	STD	Measured	UNCERTAINTY
37-139 / A	REF	UUC	ERR
UUC Time Response	(dB)	(dB)	(dB)
Fast	114.00	114.0	0.0
Slow	114.00	114.0	0.0
Log	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.
Page: 3/6

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	(± dB)
Initial	114.0	
Final	114.0	
Deviation	0.0	0.10

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY
FAST / A / 37-139	REF	UUC	ERR
STD dB	(dB)	(dB)	(dB)
130.0	130	130.0	0.0
134.0	134	134.0	0.0
129.0	129	129.0	0.0
124.0	124	124.0	0.0
119.0	119	119.0	0.0
114.0	114	114.0	0.0
109.0	109	109.0	0.0
104.0	104	104.0	0.0
99.0	99	99.0	0.0
94.0	94	93.9	-0.1
89.0	89	88.9	-0.1
84.0	84	83.9	-0.1
79.0	79	78.9	-0.1
74.0	74	73.9	-0.1
69.0	69	68.9	-0.1
64.0	64	63.9	-0.1
59.0	59	58.9	-0.1
54.0	54	54.0	0.0
49.0	49	49.0	0.0
44.0	44	44.0	0.0
39.0	39	39.2	0.2
34.0	34	34.3	0.3
29.0	29	29.4	0.4
24.0	24	24.5	0.5

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.
Page: 4/6

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY
FAST / A	REF	UUC	ERR
UUC Range	(dB)	(dB)	(dB)
37-119	42.00	42.1	0.1
	114	114.0	0.0
			(± dB)
			0.30

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY
A / 37-119	Toneburst	Ref	UUC	ERR
UUC Time Response	(ms)	(dB)	(dB)	(dB)
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	99.8	-0.1
				(± dB)
				0.20

11. Peak C Sound level

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
P10-708-01.50-01 Rev.08 Issue Date 17/2/27

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241
Request No : Req-2025-1240

12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-119	UUC	
STD Setting	(dB)	(± dB)
Positive one-half cycle	140.8	
Negative one-half cycle	140.6	
Deviated	0.2	0.20

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-119	UUC	
STD Setting	(dB)	(± dB)
Initial	138.0	
Final	138.0	
Deviated	0.0	0.10

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 laboratory.
P10-708-01.50-01 Rev.08 Issue Date 17/2/27

เอกสารไม่ควบคุม

Continuation of Certificate of Calibration Number COF-025-68

Page 2 of 3 Pages

CERTIFICATE OF CALIBRATION

Certificate No. : COF-025-68

Page 1 of 3 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

Top Load Office

Grauby GAW

G25A

15BM

UAE-EM2.033/2554

Used Item

United Analyst and Engineering Consultant Co., Ltd.

81 Sai Ulomut 41, Sukhumvit Road, Bangkok, Phrakhanong,

Bangkok 10260

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

08 Jul 2025

21 Jul 2025

23 Jul 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature

Relative Humidity

Atmospheric Pressure

23.0 ± 3.0 °C

55.0 ± 15.0 %RH

1050 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning

Measurement Condition

24 hours at ambient conditions

The average values during measurement are 24.1 °C and 50.4 %RH

Calibration procedure:

The Office gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model 681/MAC/WD-25. The MAC-CL-004 was used as a calibration guide.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standardization to realization of the International System of Units (SI) through the NMET (National Metrology Institute of Thailand) via Certificate number: NMET-17-25.

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".

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.

Calibrated by

Mr. Sontorn Thacholad
30 Mile Jitragum Lertsaengphol



Approved signature
Mr. Parinya Booncharoen
Calibration Department Manager



End of Certificate of Calibration

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 25P3507
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M
Serial No.: -
ID No.: UAE.FM.1792561

Condition As-Received: Used Item

Received Date: 03 September 2025

Calibration Date: 09 September 2025

Reference: 2509-0144WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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

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

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

Procedure used: 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	1169	MP-0218-24	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 inHg.

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 measurement result is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NIM-ONSC Accredited No. Calibration 0144

Calibrated by: Suksan Khankasaw
Issue Date: 10 September 2025

Approved Signatory: *A. Hapet P.*

[] Phalinee Pratsapal
[] Sura Suwanasri
[✓] Attapol Panurach

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

Range: 0 inHg to 36 inHg
Scale Interval: 0.1 inHg (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	0.95	-1.00	1.95	-0.05
4.00	1.95	-2.00	3.95	-0.05
6.00	2.95	-3.00	5.95	-0.05
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.00	0.00
16.00	8.00	-8.00	16.00	0.00
18.00	9.00	-9.00	18.00	0.00
20.00	10.00	-10.00	20.00	0.00
22.00	11.05	-11.00	22.05	0.05
24.00	12.05	-11.95	24.00	0.00
26.00	13.10	-12.95	26.05	0.05
28.00	14.10	-13.95	28.05	0.05
30.00	15.10	-14.95	30.05	0.05
32.00	16.15	-15.95	32.10	0.10
34.00	17.15	-16.95	34.10	0.10
35.70	18.60	-17.80	35.80	0.10

The uncertainty of measurement was ± 0.11 inHg

* 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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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 26P1523
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 10 April 2026

Calibration Date: 23 April 2026

Reference: 2604-0316WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

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

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

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

Procedure used: 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) Pressure Indicator	DPI142	1422505046	MP-0150-25	20 May 2026

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

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

4. This measurement result is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Somchai Chaichan
Issue Date: 24 April 2026

Approved Signatory: *S. Som*

[] Phalinee Pratsapal
[✓] Sura Suwanasri
[] Attapol Panurach

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Technical information and UUC settings during calibration:

Result of calibration: Without adjustment
Pressure type: Absolute Pressure
Installation: Vertical Orientation
Atmospheric pressure: (1004 ± 10) mbar
Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)
Pressure medium: Clean air
Reference level: at the center of the dial

Increasing Pressure

Applied Pressure (hPa)	955.29	956.54	977.66	988.18	998.94	1008.96	1019.79	1030.21
UUC Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	4.71	3.46	2.34	1.82	1.06	1.04	0.21	-0.21

Decreasing Pressure

Applied Pressure (hPa)	1030.19	1019.81	1008.97	998.89	988.30	977.68	966.66	955.22
UUC Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-0.19	0.19	1.03	1.11	1.70	2.32	3.34	4.78

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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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 26H712
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE/ANV/131/2550

Condition As-Received: Used Item
Received Date: 16 April 2026
Calibration Date: 17 April 2026
Reference: 2604-0315WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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

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

Procedure used: Calibration were conducted using in-house calibration procedure CP402 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	41292	23277	08 May 2026
2) Handheld Thermometer With Sensor	1523	5717096	2511200	21 Nov 2026

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

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

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

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

Result of Calibration:- Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	UUC* Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	41	-0.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	76	4.0	1.9

Result of Calibration:- Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	UUC* Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.5	-0.488	0.65
25.028	25.0	0.028	0.65
30.005	30.0	0.005	0.65
35.019	34.5	0.519	0.65
40.040	39.0	1.040	0.65

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%.

-000-

Calibrated by: Kralpop Onrat
Issue Date: 23 April 2026

Approved Signatory:

[] Chakrit Waeawarajus
[] Pornthippa Tameyakul
[x] Viporn Tantiyawutti

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เอกสารไม่ควบคุม



United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaconsultant.com E-mail: ua@uaconsultant.com

MULTI-POINT GAS TEST REPORT

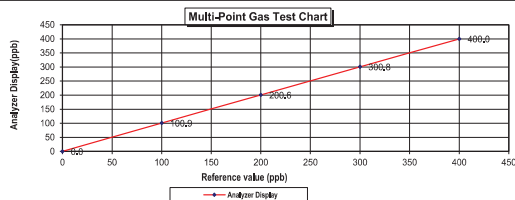
Test Date: Feb 17, 2026

Equipment: Gas Analyzer (NO₂) Model: 42i
Manufacturer: Thermo Scientific Serial Number: 1182920006

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 PPM	
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	0.90	0.89	0.89
Level 3 40.00%	200.0	0.60	0.30	0.30
Level 4 60.00%	300.0	0.80	0.27	0.27
Level 5 80.00%	400.0	0.00	0.00	0.00
Remark: Measuring Range 500.0 ppb		Average Difference (%)	0.29	



Calculate by

.....17.....02...../.....2569.....

Approve by

.....17.....Feb...../.....2026.....



United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaconsultant.com E-mail: ua@uaconsultant.com

MULTI-POINT GAS TEST REPORT

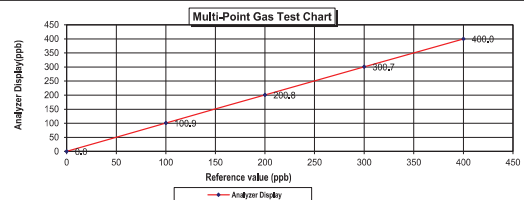
Test Date: Feb 20, 2026

Equipment: Gas Analyzer (NO₂) Model: 42i
Manufacturer: Thermo Scientific Serial Number: 1182920009

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 PPM	
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	0.90	0.89	0.89
Level 3 40.00%	200.0	0.80	0.40	0.40
Level 4 60.00%	300.0	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 (%)	0.30	



Calculate by

.....20.....02...../.....2569.....

Approve by

.....20.....Feb...../.....2026.....

MULTI-POINT GAS TEST REPORT

Test Date : Feb 24, 2026

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1201778106

Standard Gas Concentration

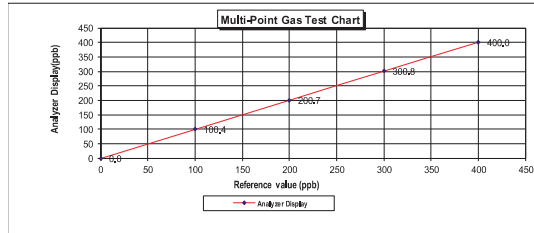
Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB0159156	
Expiration Date :	Nov 6, 2026	

Dilutor Detail

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

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.4	0.40	0.40	0.40
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range	500.0 ppb				
Acceptable Limit	± 5%				
Average Difference (%)				0.20	



Calculate by

24 / 02 / 2569

Approve by

24 / Feb / 2026

MULTI-POINT GAS TEST REPORT

Test Date : Mar 2, 2026

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

Standard Gas Concentration

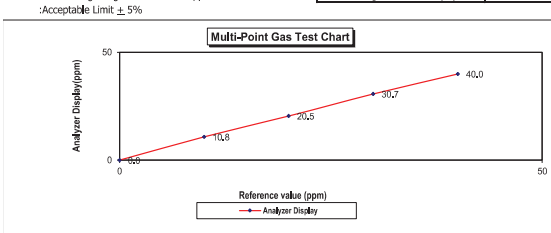
Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB0159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

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

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	0.8	7.4	7.4
Level 3	40.00%	20.0	0.5	2.4	2.4
Level 4	60.00%	30.0	0.7	2.3	2.3
Level 5	80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm				
Acceptable Limit	± 5%				
Average Difference (%)				2.43	



Calculate by

2 / 03 / 2569

Approve by

2 / Mar / 2026

MULTI-POINT GAS TEST REPORT

Test Date : July 17, 2025

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

Standard Gas Concentration

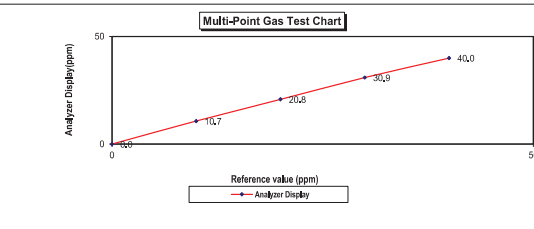
Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB0159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

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

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.7	6.5	6.5
Level 3	40.00%	20.0	20.8	3.8	3.8
Level 4	60.00%	30.0	30.9	2.9	2.9
Level 5	80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm				
Acceptable Limit	± 5%				
Average Difference (%)				2.66	



Calculate by

17 / 07 / 2568

Approve by

17 / July / 2025

MULTI-POINT GAS TEST REPORT

Test Date : July 11, 2025

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201778117

Standard Gas Concentration

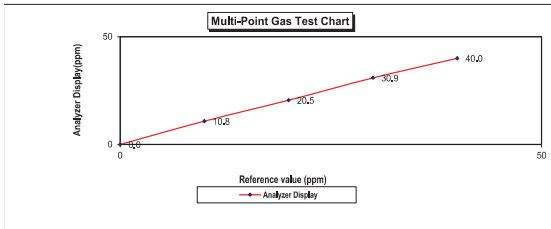
Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB0159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

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

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.8	7.4	7.4
Level 3	40.00%	20.0	20.5	2.4	2.4
Level 4	60.00%	30.0	30.9	2.9	2.9
Level 5	80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm				
Acceptable Limit	± 5%				
Average Difference (%)				2.55	



Calculate by

11 / 07 / 2568

Approve by

11 / July / 2025



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 2 March, 2026

Certification No. 133/26

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver : 2205DR0105

Wind Sensor : 2205DT0105

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 1004.1 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 120629566)

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

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8399/94

: testo, testo 645 Serial No. 02648057 : Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Digital Barometer Vaisala Type PTB330 No. 64120001

Calibrated by : Watchapol Subwat

Signed : Mr. Pisong Promsat

Mr. Watchapol Subwat

Mechanical Engineer

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 133/26

2 March, 2026

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H2O	inches H2O	m/sec	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 : Watchapol

Mr. Watchapol 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

Certification No. 133/26

2 March, 2026

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1005.83	1006	-0.17
1006.10	1006	0.10
1006.34	1006	0.34
1006.69	1006	0.69
1007.09	1007	0.09
1007.43	1007	0.43
1007.93	1008	-0.07
1008.57	1009	-0.43
1008.05	1008	0.05
1008.94	1009	-0.06
1009.34	1009	0.34
1009.06	1009	0.06
1008.75	1009	-0.25
1008.54	1008	0.54
1007.38	1008	-0.02
1007.62	1008	-0.38
1006.87	1007	-0.13
1005.48	1005	0.48
1004.81	1005	-0.19
1003.82	1004	-0.18

Average

Calibrated by : Watchapol

Mr. Watchapol 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

Certification No. 133/26

2 March, 2026

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
754.43	754	0.43
754.64	755	-0.36
754.82	755	-0.18
755.06	755	0.06
755.38	755	0.38
755.63	755	0.63
756.01	756	0.01
756.49	756	0.49
756.10	756	0.10
756.77	757	-0.23
757.07	757	0.07
756.86	757	-0.14
756.62	757	-0.38
756.47	756	0.47
756.05	756	0.05
755.76	756	-0.22
755.21	755	0.21
754.17	754	0.17
753.67	754	-0.33
752.93	753	-0.07

Average

Calibrated by : Watchapol

Mr. Watchapol 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

2 March, 2026

Certification No. 133/26

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45	0.2
30.2	30	0.2
15.4	15	0.4

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



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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 : 20 January, 2026

Certification No. 033/26

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 1009.7 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112

: Micromanometer Theodor Friedrichs F0214 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

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digital Barometer-Vaisala Type PTB220 No. 1220119

Calibrated by: Watcharapol

Signed:

Mr. Watcharapol Subwat

Mr. Pissed Promsat

Mechanical Engineer



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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

20 January, 2026

Certification No. 033/26

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	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
11.01	-	-	11.0	0.02
13.01	-	-	13.0	0.01
15.01	-	-	14.9	0.11
17.02	-	-	17.0	0.02
20.02	-	-	19.9	0.12

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

WIND DIRECTION		TESTED WIND DIRECTION	
0		0	
90		90	
180		180	
270			

Calibrated by:

Mr. Watcharapol Subwat
Mechanical Engineer



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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

20 January, 2026

Certification No. 033/26

Page : 3 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction mbar
1010.36	1011	-0.65
1010.06	1010	0.05
1009.76	1010	-0.24
1009.43	1009	0.43
1009.14	1009	0.14
1008.84	1009	-0.16
1008.55	1008	0.55
1008.24	1008	0.24
1008.11	1008	0.11
1007.54	1007	0.54
1008.16	1008	0.16
1008.52	1008	0.52
1008.91	1009	-0.09
1009.25	1009	0.25
1009.62	1009	0.62
1009.86	1010	-0.14
1010.06	1010	0.05
1010.53	1011	-0.47
1010.94	1011	-0.06
1011.16	1011	0.16

Average

Calibrated by:

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. 033/26

20 January, 2026

Page : 4 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction mmHg
757.82	758	-0.18
757.60	757	0.60
757.38	757	0.38
757.13	757	0.13
756.92	757	-0.08
756.69	756	0.69
756.47	756	0.47
756.24	756	0.24
756.14	756	0.14
755.72	756	-0.28
756.18	756	0.18
756.45	756	0.45
756.74	757	-0.26
757.00	757	0.00
757.28	757	0.28
757.46	757	0.46
757.80	758	-0.40
757.96	758	-0.04
758.27	758	0.27
758.45	758	0.45

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. 033/26

20 January, 2026

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.6	46	-0.4
30.1	30	0.1
15.7	16	-0.3

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 : 17 April, 2026

Certification No. 225/26

Page : 1 of 3

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21 ID No. : UAE.EFM.165/2565

Mfg Code : Wireless Receiver : 2205DR0114

Wind Sensor : 2205DT0114

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 : 1006.5 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112

: Micromanometer : Theodor Friedrichs FO014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241480 : 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. 02849057 : Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB334 No. V4320001

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

Signed :
Mr. Piyod Promut

Authorized Signature
for the Chief
Sub-Station Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 225/26

17 April, 2026

Page : 2 of 3

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	-	-	-	15.1	-0.09
17.02	-	-	-	17.0	0.02
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	

Calibrated by: *Watchapol*
Mr. Watchapol 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. 225/26

17 April, 2026

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1006.10	1006	0.10
1006.03	1006	0.03
1005.82	1006	-0.18
1006.54	1007	-0.46
1006.54	1008	0.54
1008.90	1009	-0.10
1009.09	1009	0.09
1009.38	1009	0.38
1009.71	1010	-0.29
1009.58	1010	-0.42
1009.91	1010	-0.09
1009.70	1010	-0.30
1009.97	1010	-0.03
1009.56	1010	-0.44
1010.44	1010	0.44
1011.20	1011	0.20
1011.24	1011	0.24
1006.94	1007	-0.06
1007.38	1007	0.38
1007.88	1008	-0.12

Average

Calibrated by :

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. 225/26

17 April, 2026

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
754.64	754	0.64
754.58	755	-0.02
754.43	754	0.43
754.97	755	-0.03
756.47	756	0.47
756.74	757	-0.26
756.88	757	-0.12
757.10	757	0.10
757.34	757	0.34
757.25	757	0.25
757.49	758	-0.51
757.34	757	0.34
757.54	757	0.54
757.23	757	0.23
757.89	758	-0.11
758.46	758	0.46
758.49	758	0.49
755.27	755	0.27
755.60	755	0.60
755.97	756	-0.03

Average

Calibrated by :

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. 225/26

17 April, 2026

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.4	45	0.4
30.2	30	0.2
15.4	15	0.4

Calibrated by :

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Preet Mankit 29 Yaek 4, Preet Mankit Road, Ladphrae, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.calibration-lab.com E-mail: info@calibration-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14466/UM14466[UAE.EFM.095/2562]
CLID. NO. : 252000053
JOB CONTROL NO. : 251222149757
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKILANONG, BANGKOK 10260

DATE OF RECEIVED : 22 December 2025

DATE OF ISSUED : 25 December 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsontorn
Authorized Signatory
25 December 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25149757

F3-011-05/12-23

page 1 of 4

เอกสารไม่ควบคุม





REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14466/UM14466[UAE.EFM.095/2562]
DATE OF CALIBRATION : 23 December 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Advanced Multimeter, Programmable Timer/Counter and Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
2. Programmable Timer/Counter, Philips Model PM6880B S/N. SM607101.
3. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0090-25, Due Date 31 July 2026.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 22 July 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25149757

F3-011-05/12-23

page 2 of 4

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.301	-0.001	1.9
0.4	50 Hz		0.400	0.401	-0.001	1.6
0.5	50 Hz		0.500	0.502	-0.002	1.6
0.6	50 Hz		0.600	0.604	-0.004	2.5
0.7	50 Hz		0.700	0.706	-0.006	2.5
0.3	100 Hz		0.300	0.301	-0.001	1.9
0.4	100 Hz	peak	0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.504	-0.004	1.6
0.6	100 Hz		0.600	0.606	+1.074	2.5
0.7	100 Hz		0.700	0.708	-0.008	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.014	-0.014	1.8
4	50 Hz		4.000	4.024	-0.024	1.8
5	50 Hz		5.000	5.038	-0.038	1.8
6	50 Hz		6.000	6.047	-0.047	1.8
7	50 Hz		7.000	7.063	-0.063	1.8
3	100 Hz		3.000	3.019	-0.019	1.6
4	100 Hz	peak	4.000	4.028	-0.028	1.6
5	100 Hz		5.000	5.035	-0.035	1.6
6	100 Hz		6.000	6.046	-0.046	1.5
7	100 Hz		7.000	7.069	-0.069	1.5

Certificate No. Q25149757

F3-011-05/12-23

page 3 of 4

เอกสารไม่ควบคุม



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.500	-0.450	1.9
0.06	50 Hz		0.060	0.060	0.000	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz		0.030	0.030	0.000	2.5
0.04	100 Hz	peak	0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 2 of 73

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q25149757

F3-011-05/12-23

page 4 of 4

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14468/UM14468 [UAE.EFM.097/2562]
CLID. NO. : 252000051
JOB CONTROL NO. : 250719084757
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED : 24 July 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsoontorn
Authorized Signatory
24 July 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25084757

F3-011-05/12-23

เอกสารไม่ควบคุม





CALIBRATION LABORATORY Co., LTD.

2/10-11, 34, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd., Ladphras, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14468/UM14468 [UAE.EFM.097/2562]
DATE OF CALIBRATION : 19 July 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter and Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25084757
F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co., LTD.

2/10-11, 34, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd., Ladphras, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.396	+0.004	1.3
0.5	50 Hz		0.500	0.494	+0.006	1.3
0.6	50 Hz		0.600	0.593	+0.007	2.5
0.7	50 Hz		0.700	0.691	+0.009	2.5
0.3	100 Hz	peak	0.300	0.299	+0.001	1.9
0.4	100 Hz		0.400	0.397	+0.003	1.3
0.5	100 Hz		0.500	0.495	+0.005	1.3
0.6	100 Hz		0.600	0.593	+0.007	2.5
0.7	100 Hz		0.700	0.692	+0.008	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.012	-0.012	1.8
4	50 Hz		4.000	4.026	-0.026	1.8
5	50 Hz		5.000	5.033	-0.033	1.8
6	50 Hz		6.000	6.047	-0.047	1.8
7	50 Hz		7.000	7.051	-0.051	1.8
3	100 Hz	peak	3.000	3.018	-0.018	2.7
4	100 Hz		4.000	4.022	-0.022	1.3
5	100 Hz		5.000	5.031	-0.031	1.3
6	100 Hz		6.000	6.049	-0.049	1.0
7	100 Hz		7.000	7.055	-0.055	1.0

Certificate No. Q25084757
F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co., LTD.

2/10-11, 34, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd., Ladphras, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.049	+0.001	1.4
0.06	50 Hz		0.060	0.059	+0.001	1.3
0.07	50 Hz		0.070	0.069	+0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.059	+0.001	1.3
0.07	100 Hz		0.070	0.069	+0.001	1.1

Note: The Scope of Accredited ANAB Certificate No. ACDM-2014 Version 015 Page 1,2 of 68

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q25084757
F3-011-05/12-23

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CALIBRATION LABORATORY Co., LTD.

2/10-11, 34, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd., Ladphras, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14472/UM14472 [UAE.EFM.101/2562]
CLID. NO. : 252000710
JOB CONTROL NO. : 251222149759
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 22 December 2025

DATE OF ISSUED : 25 December 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsontorn
Authorized Signatory
25 December 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25149759
F3-012-05/12-23

เอกสารไม่ควบคุม





REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14472/UM14472[UAE.EFM.101/2562]
DATE OF CALIBRATION : 23 December 2025

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CFEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM687101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 22 July 2026.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0054/25, Due Date 11 June 2026.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0090-25, Due Date 31 July 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25149759
F3-012-05/12-23

เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	$\pm$ (% of rdg.)
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.405	-0.005	1.6
0.5	50 Hz		0.500	0.507	-0.007	1.6
0.6	50 Hz		0.600	0.608	-0.008	2.5
0.7	50 Hz		0.700	0.709	-0.009	2.5
0.3	100 Hz		0.300	0.303	-0.003	1.9
0.4	100 Hz	peak	0.400	0.405	-0.005	1.6
0.5	100 Hz		0.500	0.507	-0.007	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.710	-0.010	2.5

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 2 of 73

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	$\pm$ (% of rdg.)
3	50 Hz	peak	3.000	3.031	-0.031	1.8
4	50 Hz		4.000	4.044	-0.044	1.8
5	50 Hz		5.000	5.057	-0.057	1.8
6	50 Hz		6.000	6.064	-0.064	1.8
7	50 Hz		7.000	7.079	-0.079	1.8
3	100 Hz		3.000	3.031	-0.031	1.8
4	100 Hz	peak	4.000	4.048	-0.048	1.8
5	100 Hz		5.000	5.059	-0.059	1.8
6	100 Hz		6.000	6.077	-0.077	1.8
7	100 Hz		7.000	7.101	-0.101	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 1,2 of 73

Certificate No. Q25149759
F3-011-05/12-23

เอกสารไม่ควบคุม



Page : 1/8

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	$\pm$ (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz		0.030	0.030	0.000	2.5
0.04	100 Hz	peak	0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 1,2 of 73

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q25149759
F3-011-05/12-23

page 4 of 4

เอกสารไม่ควบคุม



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 23-SLM-242
Name : Request No : Req-2025-1241
Address : 81 Soi Udonnuk 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Unit Under Calibration Details
Measurement Item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LA72 Microphone S/N : 011731
Serial Number : 1005288 Pre-amplifier Model : PKMLsT2B
ID : UAE.EFM.104/2562 Pre-amplifier S/N : 054075
Resolution : 0.1 dB Instrument Status : Used
Calibration Environment and Details
Temperature : $23 ^\circ\text{C} \pm 2 ^\circ\text{C}$
Humidity : $50 \% \text{RH} \pm 20 \% \text{RH}$
Barometric Pressure : $1013 \text{ hPa} \pm 10 \text{ hPa}$
Received Date : 16 July 2025
Calibrated Date : 29 July 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
Multifunction Acoustic Calibrator	Bruel&Kjaer	4226	3412381	6 May 2026	NIMT
Audio Generator	Svanick	Svan401	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. Nopadol Luangrat
Service Calibration Engineer

Approved By :
Mr. Pait Mathavorn
Calibration Engineer Supervisor
Issue Date : 29 July 2025

เอกสารไม่ควบคุม

Certificate No : 25-SLM-242
Request No : Req-2025-1241

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	After Adjust	UNCERTAINTY
FAST / A / 37-139	Level	UUC	ERR	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)
1000 Hz 114.0	114.68	115.2	0.52	114.7
			0.02	0.20

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN: AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.8	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	30.6	0.10
C	30.2	0.10
Z	34.3	0.10

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY
FAST / 37-139	Weighting Response curve	
STD Setting	A C Z	(± dB)
125 Hz	0.1 0.1 0.1	0.60
1000 Hz	0.0 0.0 0.0	0.60
4000 Hz	1.6 1.6 1.6	0.60
8000 Hz	2.3 2.2 2.3	0.70

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

File: 708-02.04-01 Rev.00 Issue date: 17/2/23

เอกสารไม่ควบคุม

Certificate No : 25-SLM-242
Request No : Req-2025-1241

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY
FAST / 37-139	Weighting Response curve	
STD Setting	A (dB) C (dB) Z (dB)	(± dB)
63 Hz	-0.1 0.0 0.0	0.20
125 Hz	-0.1 0.1 0.0	
250 Hz	-0.1 0.0 0.0	
500 Hz	0.0 0.1 0.0	
1000 Hz	0.0 0.0 0.0	
2000 Hz	0.1 0.1 0.0	
4000 Hz	0.0 0.1 0.1	
8000 Hz	0.0 0.0 0.1	
16000 Hz	0.0 0.0 -0.1	

6. Frequency and time weightings at 1kHz

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

UUC Setting	STD	Measured	UNCERTAINTY
37-139 / A	REF	UUC ERR	
UUC Time Response	(dB)	(dB) (dB)	(± dB)
Fast	114.00	114.0	0.20
Slow	114.00	114.0	
1sq	114.00	114.0	

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

File: 708-02.04-01 Rev.00 Issue date: 17/2/23

เอกสารไม่ควบคุม

Certificate No : 25-SLM-242
Request No : Req-2025-1241

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	
STD Setting	(dB)	(± dB)
Initial	114.0	0.10
Final	114.0	
Deviant	0.0	

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY
FAST / A / 37-139	REF	UUC ERR	
STD dB	(dB)	(dB) (dB)	(± dB)
139.0	139	139.0	0.30
134.0	134	134.0	
129.0	129	129.0	
124.0	124	124.0	
119.0	119	119.0	
114.0	114	114.0	
109.0	109	109.0	
104.0	104	104.0	
99.0	99	99.0	
94.0	94	94.0	
89.0	89	89.0	
84.0	84	84.0	
79.0	79	79.0	
74.0	74	74.0	
69.0	69	69.0	
64.0	64	64.0	
59.0	59	59.0	
54.0	54	54.1	
49.0	49	49.1	
44.0	44	44.2	
40.0	40	40.3	

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

File: 708-02.04-01 Rev.00 Issue date: 17/2/23

เอกสารไม่ควบคุม

Certificate No : 25-SLM-242
Request No : Req-2025-1241

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY
FAST / A	REF	UUC ERR	
UUC Range	(dB)	(dB) (dB)	(± dB)
37-139	45.20	45.4	0.30
	114	114.0	

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY
A / 37-139	Toneburst	Ref	UUC ERR	
UUC Time Response	(ms)	(dB)	(dB) (dB)	(± dB)
Fast	200	135.0	134.9	0.20
	2	118.0	117.8	
	0.25	109.0	108.7	
Slow	200	128.6	128.4	
	2	109.0	108.8	
	200	129.0	129.0	
SEL	2	109.0	108.9	-0.1
	0.25	100.0	99.8	

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY
FAST / C / 95-142	REF	UUC ERR	
STD Setting	(dB)	(dB) (dB)	(± dB)
Complete cycle	137.4	136.7	0.20
Positive half cycle	136.4	136.1	
Negative half cycle	136.4	136.1	

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

File: 708-02.04-01 Rev.00 Issue date: 17/2/23

เอกสารไม่ควบคุม

Certificate No : 25-SLM-242
Request No : Req-2025-1241

12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Positive one-half cycle	142.5	
Negative one-half cycle	142.4	
Deviated	0.1	0.20

13. High Level Stability

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

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.
P58-708-05-30-01 Rev.06 Issue date 17/12/25

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 26-SLM-165
Address : 81 Soi Udomsak 41, Sakhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2026-0976
10260

Unit Under Calibration Details

Measurement Item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LxT2 Microphone S/N : 011739
Serial Number : 0005296 Pre-amplifier Model : PHMLxT2B
ID : UAE-EFM.111.02562 Pre-amplifier S/N : 056086
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 : 4 April 2026
Calibrated Date : 23 April 2026
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&Kjaer	4226	3412381	7 May 2026	NIMT
Audio Generator	Svsmek	Svap401	131	27 September 2026	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. Pichit Mathavorn
Calibration Engineer Supervisor
Issue Date : 23 April 2026

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.
P58-708-05-30-01 Rev.06 Issue date 17/12/25

เอกสารไม่ควบคุม

Certificate No : 26-SLM-165
Request No : Req-2026-0976

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	
					(± dB)	
1000 Hz 114 dB	113.75	114.3	0.55	113.7	-0.05	0.20

Note : Absolute sensitivity was established by the use of Multifunction Acoustic Calibrator Brand SVANTEK, Model SV 35A, S/N. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	UUC	(± dB)
UUC Weighting	(dB)	
A	30.1	

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	UUC	(± dB)
UUC Weighting	(dB)	
A	29.4	
C	29.3	
Z	33.6	0.10

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

Acoustic signal test frequency Weightings (without uncertainty)				
UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A (dB)	C (dB)	Z (dB)	
FAST / 37-139				
STD Setting				
125 Hz	0.2	0.2	0.2	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	1.5	1.5	1.5	0.60
8000 Hz	1.7	1.7	1.7	0.70

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.
P58-708-05-30-01 Rev.06 Issue date 17/12/25

เอกสารไม่ควบคุม

Certificate No : 26-SLM-165
Request No : Req-2026-0976

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)
FAST / 37-139		A (dB)	C (dB)	Z (dB)	
STD Setting		A (dB)	C (dB)	Z (dB)	0.20
83 Hz		-0.1	0.0	0.0	
125 Hz		-0.1	0.1	0.0	
250 Hz		0.0	0.0	0.0	
500 Hz		0.0	0.1	0.0	
1000 Hz		0.0	0.0	0.0	
2000 Hz		0.1	0.1	0.1	
4000 Hz		0.0	0.1	0.1	
8000 Hz		0.0	0.0	0.1	
16000 Hz		0.0	0.0	0.0	

6. Frequency and time weightings at 1kHz

UUC Setting		STD	Measured		UNCERTAINTY <
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UUC Setting	STD	Measured		UNCERTAINTY
37-239 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.20
Slow	114.00	114.0	0.0	
Log	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.
P58-708-05-30-01 Rev.06 Issue date 17/12/25

เอกสารไม่ควบคุม

Certificate No : 26-SLM-165
Request No : Req-2026-0976

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY
FAST / A / 37-139	REF	UUC	ERR
STD dB	(dB)	(dB)	(dB)
139.00	139	139.0	0.0
134.00	134	134.0	0.0
129.00	129	129.0	0.0
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	54.1	0.1
49.00	49	49.1	0.1
44.00	44	44.2	0.2
39.00	39	39.6	0.6

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Instrument Calibration Laboratory. The results are valid until the date 17/3/25

เอกสารไม่ควบคุม

Certificate No : 26-SLM-165
Request No : Req-2026-0976

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY
FAST / A	REF	UUC	ERR
UUC Range	(dB)	(dB)	(dB)
37-139	45.10	45.2	0.1
	114	114.0	0.0

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY
A / 37-139	Toneburst	Ref	UUC	ERR
UUC Time Response	(ms)	(dB)	(dB)	(dB)
Fast	200	135.0	134.9	-0.1
	2	118.0	117.9	-0.1
	0.25	109.0	108.8	-0.2
Slow	200	128.6	128.5	-0.1
	2	109.0	108.8	-0.2
SEL	200	129.0	129.0	0.0
	2	109.0	109.0	0.0
	0.25	100.0	99.8	-0.2

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY
FAST / C / 95-142	REF	UUC	ERR
STD Setting	(dB)	(dB)	(dB)
Complete cycle	137.4	136.8	-0.60
Positive half cycle	138.4	136.2	-0.20
Negative half cycle	136.4	136.2	-0.20

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Instrument Calibration Laboratory. The results are valid until the date 17/3/25

เอกสารไม่ควบคุม

Certificate No : 26-SLM-165
Request No : Req-2026-0976

12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	
STD Setting	(dB)	(± dB)
Positive one-half cycle	143.8	
Negative one-half cycle	143.8	
Deviated	0.0	0.20

13. High Level Stability

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

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 Instrument Calibration Laboratory. The results are valid until the date 17/3/25

เอกสารไม่ควบคุม



ELECTRICAL AND ELECTRONICS INSTITUTE
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Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240341EA
Operation No.: CP2024090312

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX72 (Meter), 375802 (Microphone), PMLX72B (Preamplifier)
Serial No.: 0005298 (Meter), 011741 (Microphone), 056088 (Preamplifier)
ID No.: UAE.EFM.113/2562
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 3 September 2024
Calibrated Date: 23 - 25 September 2024
Issued Date: 26 September 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signatures. Printing or copy of the 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.

เอกสารไม่ควบคุม



Certificate No.: CP20240341EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX72 (Meter), 375B02 (Microphone), PRLxT28 (Preamplifier)
Serial No.: 0005298 (Meter), 011741 (Microphone), 056088 (Preamplifier)
ID No.: UAEFPM.113/2562
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	F0640002	CL1-P240022 CD20240180EA	20 March 2025 7 August 2025
6) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20240069EA	13 February 2025 19 September 2025

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)

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

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)
-	-	-	-



Certificate No.: CP20240341EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
31.1

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting (dB)	Measured value (dB)
A-weighting	31.1
C-weighting	31.0
Z-weighting	36.5

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	0.2	0.1	0.1	±1.5
1000	0.3	0.3	0.3	±1.0
8000	1.3	1.2	1.3	±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	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.1	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	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



Certificate No.: CP20240341EA

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
142.0	142.1	0.1	±1.1
143.0	143.1	0.1	±1.1



Certificate No.: CP20240341EA

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	44.2	0.2	±1.1
43.0	43.3	0.3	±1.1
42.0	42.4	0.4	±1.1
41.0	41.5	0.5	±1.1
40.0	40.5	0.5	±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	136.0	0.0	±1.0
	2	118.9	-0.1	+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
	200	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	134.1	-0.3	±2.0
Negative half cycle	134.4	134.2	-0.2	±2.0

Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
145.0	145.2	0.2	±1.5

Certificate No.: CP20240341EA

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	±0.5

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	0.25	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. The acceptance limit is for the deviated value.
2. Acceptance limits was IEC61672-3:2013 Class 2.
3. The coverage factor $k = 2.00$

-- End of Report --