

CERTIFICATE OF CALIBRATION

Certificate No. : CL-003-65

Page 1 of 2 Pages

MEASUREMENT ITEM

: Top Load Orifice

MANUFACTURER

: Tech Environmental, Inc.

MODEL/TYPE

: TE-5025A

SERIAL NUMBER

: 3383

ID NUMBER

: UAE.EFM.063/2560

CONDITION AS-RECEIVED

: Used item

CUSTOMER

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

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

Traceability:

This certificate provides a traceability of The
measurement to recognized the national
standards, and to realization of the International
system of units (SI) through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: Q281901

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

: 15 Jul 2022

MEASUREMENT DATE

: 25 Jul 2022

ISSUE DATE

: 26 Jul 2022

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature

: 23.0 ± 3.0 °C

Relative Humidity

: 55.0 ± 15.0 %RH

Atmospheric Pressure

: 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are 24.8 °C and 55.1 %RH.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☐ Mr. Sotawit Thachad
☒ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Continuation of Certificate of Calibration Number CL-003-65

Page 2 of 2 Pages

MEASUREMENT RESULTS:

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

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.697	754.265	24.640	23.960	55.399	1.699	1.299	0.643
2	1.000	754.236	24.950	24.350	62.172	3.444	1.849	0.913
3	1.118	754.323	24.730	24.210	41.925	4.582	2.133	1.051
4	1.169	754.212	24.640	24.160	31.045	5.150	2.262	1.116
5	1.416	754.175	24.480	24.210	30.117	7.629	2.754	1.353

Slope (m):

2.04804

Intercept (b):

-0.01939

Correlation coefficient (r):

0.99982

Uncertainty (k=2):

0.011 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.697	754.265	24.640	23.960	55.399	1.699	0.819	0.647
2	1.000	754.236	24.950	24.350	62.172	3.444	1.167	0.919
3	1.118	754.323	24.730	24.210	41.925	4.582	1.345	1.058
4	1.169	754.212	24.640	24.160	31.045	5.150	1.426	1.123
5	1.416	754.175	24.480	24.210	30.117	7.629	1.735	1.361

Slope (m):

1.28277

Intercept (b):

-0.01223

Correlation coefficient (r):

0.99982

Uncertainty (k=2):

0.012 m³/min

End of Certificate of Calibration



THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS GRANTED IN WRITING FROM THE LABORATORY

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No. : 23P1401

Page : 1 of 2

Equipment :

U-Tube Manometer

Manufacturer:

Dwyer

Model :

1221-36-W/M

Serial No.:

-

ID No.:

UAE.EFM.022/2560

Condition As-Received:

Used Item

Received Date:

26 April 2023

Calibration Date:

09 May 2023

Reference:

2304-0703WSC

Submitted by:

United Analyst and Engineering Consultant Co.,Ltd.

Ambient Temperature:

(23 ± 2) °C

Relative Humidity:

(50 ± 15) %

Atmospheric Pressure:

1010 mbar

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

Procedure used:

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

Condition of this result of calibration

1. Reference standards instruments :

Instrument

Model

Serial No.

Certificate No.

Due Date

1) Pressure Calibrator

PC106P

1189

MP-0137-22

24 Aug 2023

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

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

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

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Aussarree

Issue Date : 11 May 2023

Approved Signatory :

Attapol P.

[] Phalinee Prabpaipal

[] Sura Suwannasri

[x] Attapol Panurach

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B 0314241



Cert.No.: 23P1401

Page: 2 of 2

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

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

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-0.98	1.98	-0.02
4.00	2.00	-1.98	3.98	-0.02
6.00	3.00	-2.98	5.98	-0.02
8.00	4.00	-3.98	7.98	-0.02
10.00	5.00	-4.98	9.98	-0.02
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	11.00	-11.00	22.00	0.00
24.00	12.00	-12.00	24.00	0.02
26.00	13.00	-13.00	26.00	0.02
28.00	14.00	-14.00	28.00	0.02
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.04
34.00	17.00	-17.00	34.00	0.02
35.80	18.00	-17.96	35.96	0.16

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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

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Attapol P.

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a 1160340

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 : 22-AFM-172
Request No : Req-2022-1866

Unit Under Calibration Details

Measurement Item : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
ID : UAE.EFM.174/2561
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 12 October 2022
Calibration Date : 31 October 2022

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


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 High Flow	18501012012	Sensidyne	15 June 2023


Traceability :

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

Note :

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

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 31 October 2022

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

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

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Certificate No : 22-AFM-172
Request No : Req-2022-1866

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(LPM)	(LPM)	(LPM)	(LPM)	(LPM)
14.5	14.51	14.59	-0.08	0.21
15.0	15.01	15.12	-0.11	0.22
15.8	15.80	15.92	-0.12	0.23
16.6	16.62	16.73	-0.11	0.24
18.3	18.31	18.40	-0.09	0.26

Note

STD : Standard

UUC : Unit Under Calibration

Calibration media : Air

* Indicates non accredited

End of Certificate

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

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

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Certificate of Calibration

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

Certificate No : 22-TPM-428
Request No : Req-2022-1866
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 163268
Resolution : 0.1 °C
ID Number : UAE.EFM.174/2561

Range Calibration : 20 °C to 45 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 12 October 2022
Calibrated Date : 31 October 2022


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

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No. : QR22-0578

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

Note

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

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 31 October 2022

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

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

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Calibration Note


UUC Adjustment : Not Adjust

Certificate No : 22-TPM-428
Request No : Req-2022-1866
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
Ta	20.003	19.8	+0.2	0.14
	25.004	24.8	+0.2	0.14
	30.003	29.8	+0.2	0.14
	35.003	34.8	+0.2	0.14
	40.003	39.8	+0.2	0.14
	45.003	44.8	+0.2	0.14
Tf	20.003	20.0	0.0	0.14
	25.004	24.9	+0.1	0.14
	30.003	29.9	+0.1	0.14
	35.003	34.9	+0.1	0.14
	40.003	39.9	+0.1	0.14
	45.003	44.9	+0.1	0.14

End of Certificate

Calibrated By : 
Mr. Noppadon Luangart

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

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

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Certificate of Calibration

Certificate No.: 23P1858
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.124/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 02 June 2023

Reference: 2305-0919WSC

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

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.

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

Condition of this result of calibration

1. Reference standards instruments :

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------|--------|------------|-----------------|-------------|
| 1) Standard Barometer | DPI142 | 1422505046 | MP-0094-23 | 03 May 2024 |
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. This result of calibration instrument was in absolute pressure.
5. This instrument was used clean air as pressure media.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suksan Khankaew
Issue Date: 06 June 2023

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

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B 0316958



Result of calibration:- Without adjustment

Range: 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	959.93	970.47	981.93	991.32	1002.29	1011.64	1021.14	1032.30
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	0.07	-0.47	-1.93	-1.32	-2.29	-1.64	-1.14	-2.30

Decreasing Pressure

Applied Pressure (hPa)	1032.30	1021.44	1011.67	1002.36	992.35	981.94	970.49	959.94
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.30	-1.44	-1.67	-2.36	-2.35	-1.94	-0.49	0.06

The uncertainty of measurement was ± 0.30 hPa

* UUC = Unit Under Calibration

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

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a 1165506



Certificate of Calibration

Certificate No.: 23H1200
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.130/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 30 May 2023

Reference: 2305-0919WSC

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

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-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) Hygro-M2 Dew Point Monitor | 5112 | 2360195 | 20703 | 02 Aug 2023 |
| 2) Handheld Thermometer With Sensor | 1523 | 3240076 | 231305 | 15 Mar 2024 |

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

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

- National Institute of Standards and Technology (NIST) , The United States of America
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Somchai Dumwor
Issue Date: 07 June 2023

Approved Signatory: *Chakrit Waewwanua*
[] Ponthippa Tameyakul
[] Viporn Tantiyawutti

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B 0316274



Result of Calibration:-

Before Adjustment

Function:

Humidity Measurement

Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)
25.0	40.1	48	7.9	1.6
25.0	60.0	63	3.0	1.7
25.0	80.0	76	-4.0	1.9

Result of Calibration:-

After Adjustment

Function:

Humidity Measurement

Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	75	-5.0	1.9

Result of Calibration:-

Without Adjustment

Function:

Temperature Measurement

Standard Temperature	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(°C)	(°C)	(±°C)
19.987	20.0	0.013	0.72
30.016	30.0	-0.016	0.72
39.944	39.5	-0.444	0.72

UUC* : Unit Under Calibration

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

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a 1165295



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 : 31 March, 2023

Certification No. 143/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21

WIND SENSOR : WL-21

Mfg Code : WIRELESS RECEIVER : 2111DR0041

WIND SENSOR : 2111DT0041

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 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB320 No. V1220015

Digital Barometer Vaisala Type PTB330 No. V-3320001

Calibrated by : Watchapol

Signed :

Mr. Watchapol Subwat

Mr. Paoon Pramsut

Mechanical Engineer

Authorized (Signature) :

for the Chief

Sub-Standard and Control

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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. 143/23

31 March, 2023

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	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	-	-	-	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	-	-	-	20.0	0.02

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

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. 143/23

31 March, 2023

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1014.29	1014	0.29
1014.02	1014	0.02
1011.47	1012	-0.53
1011.25	1011	0.25
1011.11	1011	0.11
1011.38	1012	-0.62
1011.71	1012	-0.29
1013.48	1014	-0.52
1013.81	1014	-0.19
1014.02	1014	0.02
1013.73	1013	0.73
1013.32	1013	0.32
1014.92	1015	-0.08
1014.75	1015	-0.25
1014.38	1014	0.38
1014.21	1014	0.21
1013.57	1013	0.57
1013.01	1013	0.01
1011.26	1011	0.26
1011.59	1012	-0.41

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. 143/23

31 March, 2023

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
760.78	761	-0.22
760.58	761	-0.42
758.66	759	-0.34
758.50	758	0.50
758.39	758	0.39
758.60	759	-0.40
758.84	759	-0.16
760.17	760	0.17
760.42	760	0.42
760.58	761	-0.42
760.36	760	0.36
760.05	760	0.05
761.25	761	0.25
761.12	761	0.12
760.85	761	-0.15
760.72	761	-0.28
760.24	760	0.24
759.82	760	-0.18
758.51	759	-0.49
758.75	759	-0.25

Average

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. 143/23

31 March, 2023

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.24	45.4	-0.16
32.16	32.3	-0.14
16.48	16.5	-0.02

Calibrated by :

Watharapol

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 : 10 April, 2023

Certification No. 178/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21

WIND SENSOR : WL-21

Mfg Code : WIRELESS RECEIVER : 2111DR0052

WIND SENSOR : 2111DT0052

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 1006.9 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB322 No. 1220015

: Digital Barometer Vaisala Type PTB330 No. 14320001

Calibrated by : Watharapol

Signed : Mr. Pisod Promsut

Mr. Watcharapol Subwat

Mr. Pisod Promsut

Mechanical Engineer

(Authorized Signature)

for the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 178/23

10 April, 2023

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.9	0.12
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

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

Calibrated by :

Watharapol

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. 178/23

10 April, 2023

Page : 3 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction
1013.17	1013	0.17
1013.43	1014	-0.57
1014.15	1014	0.15
1014.22	1014	0.22
1009.63	1009	0.63
1009.71	1010	-0.29
1009.95	1010	-0.05
1010.31	1010	0.31
1010.72	1011	-0.28
1010.80	1011	-0.20
1011.47	1011	0.47
1011.21	1011	0.21
1011.33	1011	0.33
1011.59	1012	-0.41
1011.89	1012	-0.11
1012.40	1012	0.40
1008.64	1009	-0.36
1008.80	1009	-0.20
1009.25	1009	0.25
1009.45	1009	0.45

Average

0.06

Calibrated by :

Watharapol

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. 178/23

10 April, 2023

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
759.94	760	-0.06
760.13	760	0.13
760.67	761	-0.33
760.73	761	-0.27
757.28	757	0.28
757.34	757	0.34
757.52	758	-0.48
757.79	758	-0.21
758.10	758	0.10
758.16	758	0.16
758.66	759	-0.34
758.47	758	0.47
758.56	758	0.56
758.75	759	-0.25
758.98	759	-0.02
759.36	759	0.36
756.54	757	-0.46
756.66	757	-0.34
757.00	757	0.00
757.15	757	0.15

Average

0.04

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. 178/23

10 April, 2023

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.15	45.3	-0.15
31.05	31.1	-0.05
15.32	15.5	-0.18

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 : 10 April, 2023

Certification No. 177/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21

WIND SENSOR : WL-21

Mfg Code : WIRELESS RECEIVER : 2112DR0065

WIND SENSOR : 2112DT0065

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 1007.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB330 No. V1320001

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

Signed : *Pisut*
Mr. Pisut Promsut

(Authorized Signatory)
For the Chief
Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 177/23

10 April, 2023

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H2O	inches H2O	m/sec	m/sec	m/sec
m/sec					
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.

US.DEPARTMENT OF COMMERCE WEATHER BUREAU

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

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

(Authorized Signatory)
For the Chief
Sub-Standard Instrument

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 177/23

10 April, 2023

Page : 3 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction
1013.17	1013	0.17
1013.43	1014	-0.57
1014.15	1014	0.15
1014.22	1014	0.22
1009.63	1010	-0.37
1009.71	1010	-0.29
1009.95	1010	-0.05
1010.31	1010	0.31
1010.72	1011	-0.28
1010.80	1011	-0.20
1011.47	1011	0.47
1011.21	1011	0.21
1011.33	1011	0.33
1011.59	1011	0.59
1011.89	1012	-0.11
1012.40	1012	0.40
1008.64	1009	-0.36
1008.80	1009	-0.20
1009.25	1009	0.25
1009.45	1010	-0.55

Average

0.01

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 177/23

10 April, 2023

Page : 4 of 5

Standard Barometer Pressure	Tested Barometer Pressure	Correction
759.94	760	-0.06
760.13	760	0.13
760.67	761	-0.33
760.73	761	-0.27
757.28	757	0.28
757.34	757	0.34
757.52	758	-0.48
757.79	758	-0.21
758.10	758	0.10
758.16	758	0.16
758.66	759	-0.34
758.47	759	-0.53
758.56	759	-0.44
758.75	759	-0.25
758.98	759	-0.02
759.36	759	0.36
756.54	756	0.54
756.66	757	-0.34
757.00	757	0.00
757.15	757	0.15

Average

0.06

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 177/23

10 April, 2023

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.15	45.2	-0.05
31.05	31.0	0.05
15.32	15.4	-0.08

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 31 March, 2023

Certification No. 142/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21
WIND SENSOR : WL-21Mfg Code : WIRELESS RECEIVER : 2112DR0072
WIND SENSOR : 2112DT0072Customer : 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 1008.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Digital Barometer Vaisala Type PTB330 No. JK4320001

Calibrated by :

Mr. Watcharapol Subwat
Mechanical Engineer

Signed :

Mr. Pisood Promsut

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 142/23

31 March, 2023

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer					
m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.1	-0.08
11.02	-	-	-	10.9	0.12
13.01	-	-	-	12.9	0.11
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	

Calibrated by :

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. 142/23

31 March, 2023

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1014.29	1014	0.29
1014.02	1014	0.02
1011.47	1011	0.47
1011.25	1011	0.25
1011.11	1011	0.11
1011.38	1011	0.38
1011.71	1012	-0.29
1013.48	1013	0.48
1013.81	1014	-0.10
1014.02	1014	0.02
1013.73	1014	-0.27
1013.32	1013	0.32
1014.92	1015	-0.08
1014.75	1015	-0.25
1014.38	1014	0.38
1014.21	1014	0.21
1013.57	1013	0.57
1013.01	1013	0.01
1011.26	1011	0.26
1011.59	1012	-0.41

Average

Calibrated by :

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. 142/23

31 March, 2023

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
760.78	761	-0.22
760.58	760	0.58
758.66	759	-0.34
758.50	759	-0.50
758.39	758	0.39
758.60	759	-0.40
758.84	759	-0.16
760.17	760	0.17
760.42	760	0.42
760.58	761	-0.42
760.36	760	0.36
760.05	760	0.05
761.25	761	0.25
761.12	761	0.12
760.85	761	-0.15
760.72	761	-0.28
760.24	760	0.24
759.82	760	-0.18
758.51	758	0.51
758.75	759	-0.25

Average 0.01

Calibrated by :

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. 142/23

31 March, 2023

Page : 5 of 5

Standard	Temperature Sensor Reading	
	Reading	Correction
Temp. °C	°C	°C
45.24	45.5	-0.26
32.16	32.3	-0.14
16.48	16.5	-0.02

Calibrated by :

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 11 April, 2023

Certification No. 161/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21

WIND SENSOR : WL-21

Mfg Code : WIRELESS RECEIVER : 2112DR0102

WIND SENSOR : 2112DT0102

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 1008.5 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

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

Serial Number 110730029 (sensor 120629586)

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

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. 71220015

Digital Barometer Vaisala Type PTB330 No. K4220001

Calibrated by : *Watcharapol*

Signed :

MA Pong Promsut

Mr. Watcharapol Subwat

Mechanical Engineer

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 161/23

11 April, 2023

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches H2O	inches H2O	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	-	-	-	10.9	0.12
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 161/23

11 April, 2023

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure (mbar)	Pressure (mbar)	(mbar)
1010.39	1010	0.39
1011.13	1011	0.13
1011.31	1011	0.31
1011.57	1012	-0.43
1008.42	1008	0.42
1008.86	1009	-0.14
1008.99	1009	-0.01
1009.36	1009	0.36
1009.94	1010	-0.06
1010.36	1010	0.36
1009.53	1009	0.53
1009.85	1010	-0.15
1010.06	1010	0.06
1010.23	1010	0.23
1009.06	1009	0.06
1009.21	1009	0.21
1009.71	1010	-0.29
1010.32	1010	0.32
1011.21	1011	0.21
1011.50	1012	-0.50

Average

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 161/23

11 April, 2023

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure (mmHg)	Pressure (mmHg)	(mmHg)
757.85	758	-0.15
758.41	758	0.41
758.54	759	-0.46
758.74	759	-0.26
758.38	758	0.38
758.71	757	-0.29
758.80	757	-0.20
757.08	757	0.08
757.52	758	-0.48
757.83	758	-0.17
757.21	757	0.21
757.45	757	0.45
757.61	758	-0.39
757.73	758	-0.27
758.86	757	-0.14
758.97	757	-0.03
757.34	757	0.34
757.80	758	-0.20
758.47	758	0.47
758.69	759	-0.31

Average

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 161/23

11 April, 2023

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.12	45.1	0.02
31.24	31.4	-0.16
15.82	16.0	-0.18

Calibrated by :

W. Watcharapol

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 : 17 April, 2023

Certification No. 163/23

Page : 1 of 5

Object : WIRELESS ANEMOMETER

Manufacturer : SCARLET

Type : WIRELESS RECEIVER : WL-21
WIND SENSOR : WL-21

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 1008.5 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

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

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

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

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

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB330 No. R4320001

Calibrated by : W. Watcharapol

Signed : P. Pisood Promsut

Mr. Watcharapol Subwat

Mr. Pisood Promsut

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. 163/23

17 April, 2023

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.02	-	-	-	11.0	0.02
13.01	-	-	-	12.9	0.11
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

W. Watcharapol

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

17 April, 2023

Certification No. 163/23

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Standard Barometer Pressure (mbar)	Tested Barometer Pressure (mbar)	Correction (mbar)
1011.56	1011	0.56
1011.31	1011	0.31
1010.68	1011	-0.32
1010.29	1010	0.29
1007.21	1007	0.21
1007.60	1007	0.60
1008.36	1008	0.36
1007.98	1008	-0.02
1008.32	1008	0.32
1007.88	1008	-0.12
1008.07	1008	0.07
1008.42	1008	0.42
1008.61	1009	-0.39
1009.33	1009	0.33
1009.68	1010	-0.32
1009.94	1010	-0.16
1009.90	1010	-0.10
1010.19	1010	0.19
1010.34	1010	0.34
1007.25	1007	0.25

Average

Calibrated by :

W. Watcharapol

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. 163/23

17 April, 2023

Page : 4 of 5

Standard Barometer Pressure (mmHg)	Tested Barometer Pressure (mmHg)	Correction (mmHg)
758.73	759	-0.27
758.54	759	-0.46
758.07	758	0.07
757.78	758	-0.22
755.47	755	0.47
755.76	756	-0.24
756.33	756	0.33
756.05	756	0.05
756.30	756	0.30
755.97	756	-0.03
756.11	756	0.11
756.38	756	0.38
756.52	757	-0.48
757.06	757	0.06
757.32	757	0.32
757.44	757	0.44
757.49	758	-0.51
757.70	758	-0.30
757.82	758	-0.18
755.50	756	-0.50

Average

0.03

Calibrated by :
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 163/23

17 April, 2023

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.26	45.3	-0.04
30.18	30.2	-0.02
16.32	16.4	-0.08

Calibrated by :

Mr. Watcharapol Subwat
Mechanical Engineer



เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co., LTD.

2/10-11/14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, 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 : 721A2501/721A2901
SERIAL NO. : UM12888/UM12888
CLID. NO. : 251900037
JOB CONTROL NO. : 230228022492

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

DATE OF RECEIVED : 28 February 2023

DATE OF ISSUED : 02 March 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
02 March 2023



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. Q23022492
F3-011-04/01-12

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co., LTD.

2/10-11/14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, 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 : 721A2501/721A2901
SERIAL NO. : UM12888/UM12888
DATE OF CALIBRATION : 01 March 2023

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, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, HP Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0075/22, Due Date 27 July 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23022492
F3-011-04/01-12

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CALIBRATION LABORATORY Co., LTD.

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CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

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	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.396	+0.004	1.9
0.5	50 Hz		0.500	0.493	+0.007	1.3
0.6	50 Hz		0.600	0.591	+0.009	1.3
0.7	50 Hz		0.700	0.690	+0.010	1.3
0.3	100 Hz	peak	0.300	0.299	+0.001	1.9
0.4	100 Hz		0.400	0.398	+0.002	1.9
0.5	100 Hz		0.500	0.497	+0.003	1.3
0.6	100 Hz		0.600	0.595	+0.005	1.3
0.7	100 Hz		0.700	0.693	+0.007	1.3

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	3.011	-0.011	1.8
4	50 Hz		4.000	4.017	-0.017	1.8
5	50 Hz		5.000	5.021	-0.021	1.8
6	50 Hz		6.000	6.023	-0.023	1.8
7	50 Hz		7.000	7.029	-0.029	1.8
3	100 Hz	peak	3.000	3.016	-0.016	1.8
4	100 Hz		4.000	4.019	-0.019	1.8
5	100 Hz		5.000	5.023	-0.023	1.8
6	100 Hz		6.000	6.027	-0.027	1.8
7	100 Hz		7.000	7.030	-0.030	1.8

Certificate No. Q23022492

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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	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.059	+0.001	1.3
*0.07	50 Hz		0.070	0.069	+0.001	1.2
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	1.5
0.06	100 Hz		0.060	0.059	+0.001	1.3
0.07	100 Hz		0.070	0.069	+0.001	1.2

Note. * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

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

End of Certificate

Certificate No. Q23022492

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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, 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 : 721A2501/721A2901
SERIAL NO. : UM13368/UM13368
CLID. NO. : 251900391
JOB CONTROL NO. : 230211015868

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

DATE OF RECEIVED : 11 February 2023

DATE OF ISSUED : 14 February 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

[Signature]

Approved By : Mongkol Yotsontorn
Authorized Signatory
14 February 2023



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. Q23015868

F3-011-04/01-12

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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, 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 : 721A2501/721A2901
SERIAL NO. : UM13368/UM13368
DATE OF CALIBRATION : 13 February 2023

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, High Resolution Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 S/N. 29320.
2. High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23015868

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Tel: 02-578-0353-4 Fax: 02-578-2672 www.cai-laboratory.com E-mail:sale@cai-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

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	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.9
0.5	50 Hz		0.500	0.506	-0.006	1.3
0.6	50 Hz		0.600	0.608	-0.008	1.3
0.7	50 Hz		0.700	0.710	-0.010	1.3
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.405	-0.005	1.9
0.5	100 Hz		0.500	0.507	-0.007	1.3
0.6	100 Hz		0.600	0.609	-0.009	1.3
0.7	100 Hz		0.700	0.710	-0.010	1.3

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	3.022	-0.022	1.8
4	50 Hz		4.000	4.033	-0.033	1.8
5	50 Hz		5.000	5.043	-0.043	1.8
6	50 Hz		6.000	6.051	-0.051	1.8
7	50 Hz		7.000	7.067	-0.067	1.8
3	100 Hz	peak	3.000	3.023	-0.023	1.8
4	100 Hz		4.000	4.031	-0.031	1.8
5	100 Hz		5.000	5.043	-0.043	1.8
6	100 Hz		6.000	6.051	-0.051	1.8
7	100 Hz		7.000	7.063	-0.063	1.8

Certificate No. Q23015868

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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	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.060	0.000	1.3
*0.07	50 Hz		0.070	0.071	-0.001	1.4
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	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: * means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

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

End of Certificate

Certificate No. Q23015868

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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cai-laboratory.com E-mail:sale@cai-laboratory.com



CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cai-laboratory.com E-mail:sale@cai-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14105/UM14105
CLID. NO. : 252001626
JOB CONTROL NO. : 230228022490

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

DATE OF RECEIVED : 28 February 2023

DATE OF ISSUED : 02 March 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsontorn
Authorized Signatory
02 March 2023



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. Q23022490

F3-011-04/01-12

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14105/UM14105
DATE OF CALIBRATION : 01 March 2023

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, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, HP Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0075/22, Due Date 27 July 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23022490

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CONDITION OF CALIBRATION ITEM : GOOD

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	0.301	-0.001	1.9
0.4	50 Hz		0.400	0.403	-0.003	1.9
0.5	50 Hz		0.500	0.504	-0.004	1.3
0.6	50 Hz		0.600	0.606	-0.006	1.3
0.7	50 Hz		0.700	0.707	-0.007	1.3
0.3	100 Hz	peak	0.300	0.304	-0.004	1.9
0.4	100 Hz		0.400	0.408	-0.008	1.9
0.5	100 Hz		0.500	0.510	-0.010	1.3
0.6	100 Hz		0.600	0.611	-0.011	1.3
0.7	100 Hz		0.700	0.713	-0.013	1.3

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	3.009	-0.009	1.8
4	50 Hz		4.000	4.014	-0.014	1.8
5	50 Hz		5.000	5.017	-0.017	1.8
6	50 Hz		6.000	6.021	-0.021	1.8
7	50 Hz		7.000	7.027	-0.027	1.8
3	100 Hz	peak	3.000	3.026	-0.026	1.8
4	100 Hz		4.000	4.032	-0.032	1.8
5	100 Hz		5.000	5.045	-0.045	1.8
6	100 Hz		6.000	6.061	-0.061	1.8
7	100 Hz		7.000	7.078	-0.078	1.8

Certificate No. Q23022490

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@ccalibration

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	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.061	-0.001	1.3
*0.07	50 Hz		0.070	0.072	-0.002	1.2
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	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.072	-0.002	1.2

Note: * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

End of Certificate

Certificate No. Q23022490

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@ccalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14106/UM14106
CLID. NO. : 252100074
JOB CONTROL NO. : 230221019603

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

DATE OF RECEIVED : 21 February 2023

DATE OF ISSUED : 24 February 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
24 February 2023



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. Q23019603

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@ccalibration



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14106/UM14106
DATE OF CALIBRATION : 22 February 2023

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, High Resolution Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23019603

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@ccalibration



CONDITION OF CALIBRATION ITEM : GOOD

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	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.397	+0.003	1.9
0.5	50 Hz		0.500	0.497	+0.003	1.3
0.6	50 Hz		0.600	0.596	+0.004	1.3
0.7	50 Hz		0.700	0.695	+0.005	1.3
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.505	-0.005	1.3
0.6	100 Hz		0.600	0.606	-0.006	1.3
0.7	100 Hz		0.700	0.707	-0.007	1.3

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	3.011	-0.011	1.8
4	50 Hz		4.000	4.023	-0.023	1.8
5	50 Hz		5.000	5.035	-0.035	1.8
6	50 Hz		6.000	6.041	-0.041	1.8
7	50 Hz		7.000	7.056	-0.056	1.8
3	100 Hz	peak	3.000	3.021	-0.021	1.8
4	100 Hz		4.000	4.033	-0.033	1.8
5	100 Hz		5.000	5.044	-0.044	1.8
6	100 Hz		6.000	6.061	-0.061	1.8
7	100 Hz		7.000	7.073	-0.073	1.8

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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	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.059	+0.001	1.3
*0.07	50 Hz		0.070	0.069	+0.001	1.2
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	1.5
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note, * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

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

End of Certificate

Certificate No. Q23019603

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@clccalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11055/UM11055
CLID. NO. : 252000387
JOB CONTROL NO. : 230228022491

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

DATE OF RECEIVED : 28 February 2023

DATE OF ISSUED : 02 March 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsontorn
Authorized Signatory
02 March 2023



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. Q23022491

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@clccalibration



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11055/UM11055
DATE OF CALIBRATION : 01 March 2023

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 5) %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, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 S/N. 29320.
2. Universal Counter, HP Model 5315A S/N. 2448A13042.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0075/22, Due Date 27 July 2023.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23022491

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@clccalibration



CONDITION OF CALIBRATION ITEM : GOOD

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	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.9
0.5	50 Hz		0.500	0.506	-0.006	1.3
0.6	50 Hz		0.600	0.608	-0.008	1.3
0.7	50 Hz		0.700	0.709	-0.009	1.3
0.3	100 Hz		0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.405	-0.005	1.9
0.5	100 Hz	peak	0.500	0.507	-0.007	1.3
0.6	100 Hz		0.600	0.609	-0.009	1.3
0.7	100 Hz		0.700	0.711	-0.011	1.3

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	3.029	-0.029	1.8
4	50 Hz		4.000	4.041	-0.041	1.8
5	50 Hz		5.000	5.052	-0.052	1.8
6	50 Hz		6.000	6.061	-0.061	1.8
7	50 Hz		7.000	7.073	-0.073	1.8
3	100 Hz		3.000	3.021	-0.021	1.8
4	100 Hz		4.000	4.017	-0.017	1.8
5	100 Hz	peak	5.000	5.023	-0.023	1.8
6	100 Hz		6.000	6.031	-0.031	1.8
7	100 Hz		7.000	7.042	-0.042	1.8

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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	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.060	0.000	1.3
*0.07	50 Hz		0.070	0.071	-0.001	1.2
0.03	100 Hz		0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz	peak	0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note: * means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

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

End of Certificate

Certificate No. Q23022491

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เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11056/UM11056
CLID. NO. : 252000389
JOB CONTROL NO. : 230211015867

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

DATE OF RECEIVED : 11 February 2023

DATE OF ISSUED : 14 February 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsontorn
Authorized Signatory
14 February 2023



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. Q23015867

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เอกสารไม่ควบคุม

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11056/UM11056
DATE OF CALIBRATION : 13 February 2023

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, High Resolution Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0207/21, Due Date 31 May 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

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. Q23015867

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เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 22-ACT-249
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2022-0629
10260

Unit Under Calibration Details


Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LX72 Microphone S/N : 329356
Serial Number : 0005304 Preamplifier Model : PRLX72B
ID : UAE-EFM.115/2562 Preamplifier S/N : 056099
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 : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangrat
Calibration Officer

Approved By : 
Mr. Paet Mathavan
Calibration Engineer Supervisor
Issue Date : 1 April 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority. **เอกสารไม่ควบคุม**
TS-100-SLM-01 Rev.01 Initial date: 01/07/19

Certificate No : 22-ACT-249
Request No : Req-2022-0629

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.8	-0.05	113.9	0.05	0.20	0.3

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	24.7	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	24.1	0.10
C	23.5	0.10
Z	27.8	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.1	0.1	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.4	0.3	0.3	0.60	3.0
8000 Hz	-0.2	-0.3	-0.1	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority. **เอกสารไม่ควบคุม**
TS-100-SLM-01 Rev.01 Initial date: 01/07/19

Certificate No : 22-ACT-249
Request No : Req-2022-0629

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

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

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139	REF	(dB)	(dB)	(± dB)	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.1	0.1	0.2	0.2
Z	114.00	114.1	0.1	0.2	0.2

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority. **เอกสารไม่ควบคุม**
TS-100-SLM-01 Rev.01 Initial date: 01/07/19

Certificate No : 22-ACT-249
Request No : Req-2022-0629

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	REF	UUC (dB)	ERR (dB)		
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0	0.3	1.1
129.00	129	129.0	0.0	0.3	1.1
124.00	124	124.0	0.0	0.3	1.1
119.00	119	119.0	0.0	0.3	1.1
114.00	114	114.0	0.0	0.3	1.1
109.00	109	109.0	0.0	0.3	1.1
104.00	104	104.0	0.0	0.3	1.1
99.00	99	98.9	-0.1	0.3	1.1
94.00	94	94.0	0.0	0.3	1.1
89.00	89	89.0	0.0	0.3	1.1
84.00	84	84.0	0.0	0.3	1.1
79.00	79	79.0	0.0	0.3	1.1
74.00	74	74.0	0.0	0.3	1.1
69.00	69	69.0	0.0	0.3	1.1
64.00	64	64.0	0.0	0.3	1.1
59.00	59	59.0	0.0	0.3	1.1
54.00	54	54.0	0.0	0.3	1.1
49.00	49	49.0	0.0	0.3	1.1
44.00	44	44.1	0.1	0.3	1.1
39.00	39	39.3	0.3	0.3	1.1
38.00	38	38.4	0.4	0.4	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority. **เอกสารไม่ควบคุม**
TS-100-SLM-01 Rev.01 Initial date: 01/07/19

Certificate No : 22-ACT-249
Request No : Req-2022-0629

9. Level linearity including the level range control

UUC Setting	STD	Measured			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		REF	UUC	ERR		
FAST / A	(dB)	(dB)	(dB)			
UUC Range	(dB)	(dB)	(dB)			
37-139	43.9	44.1	0.2	0.3	1.1	
	114	114.0	0.0		1.1	

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
			UUC	ERR		
A / 37-139	Toneburst (ms)	Ref (dB)	UUC (dB)	ERR (dB)		
UUC Time Response						
Fast	200	135.0	135.0	0.0	0.3	1.0
	2	118.0	117.8	-0.2		+1.0, -2.5
	0.25	109.0	108.8	-0.2		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	100.0	99.9	-0.1		+1.5, -5.0
SEL	200	129.0	129.0	0.0	0.3	1.0
	2	109.0	108.9	-0.1		+1.0, -2.5
	0.25	100.0	99.9	-0.1		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		REF	UUC	ERR		
FAST / C / 95-142	(dB)	(dB)	(dB)			
STD Setting	(dB)	(dB)	(dB)			
Complete cycle	137.4	136.9	-0.50	0.2	3.0	
Positive half cycle	136.4	136.2	-0.20		2.0	
Negative half cycle	136.4	136.2	-0.20		2.0	

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

Certificate No : 22-ACT-249
Request No : Req-2022-0629

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	142.9		
Negative one-half cycle	142.7		
Deviated	0.2	0.2	1.5

13. High Level Stability

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

End of Certificate

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

Certificate of Calibration

Customer

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

Certificate No : 22-ACT-248
Request No : Req-2022-0628

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LX72
Serial Number : 0005344
ID : UAE.EFM.041/2563
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 329362
Preamplifier Model : PRMLxT2C
Preamplifier S/N : 071494
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 : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	S/N.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFAA000234	14 June 2022	TSI
Audio Generator	Svante	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 1 April 2022

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

Certificate No : 22-ACT-248
Request No : Req-2022-0628

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139							
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.00 dB	113.85	113.7	-0.15	113.9	0.05	0.20	0.3

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	29.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	28.8	0.10
C	28.4	0.10
Z	32.6	0.10

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

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

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

Certificate No : 22-ACT-248
Request No : Req-2022-0628

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

Electrical signature tests or frequency weightings, weighting network response with relative to 1 kHz						
UUC Setting		Deviation from various Frequency			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 37-139		Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)			
63 Hz	-0.2	-0.1	-0.1	0.2		2.0
125 Hz	-0.1	0.0	0.0			1.5
250 Hz	-0.1	0.0	0.0			1.5
500 Hz	-0.1	0.0	0.0			1.5
1000 Hz	0.0	0.0	0.0			1.0
2000 Hz	0.0	0.0	0.0			2.0
4000 Hz	0.0	0.0	0.0			3.0
8000 Hz	-0.1	-0.1	0.0			5.0
16000 Hz	-0.1	-0.1	-0.1			+5, -INF.

6. Frequency and time weightings at 1kHz

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

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

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

Certificate No : 22-ACT-248
Request No : Req-2022-0628

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	98.9	-0.1		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.1	0.1		1.1
39.00	39	39.4	0.4		1.1
38.00	38	38.5	0.5		1.1

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-248
Request No : Req-2022-0628

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
37-139	44.2	44.4	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 37-139	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	135.0	0.0	0.3	1.0
	2	118.0	117.7	-0.3		+1.0, -2.5
	0.25	109.0	108.8	-0.2		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	109.0	109.1	+0.1		+1.0, -2.5
SEL	200	129.0	129.1	+0.1		1.0
	2	109.0	109.1	+0.1		+1.0, -2.5
	0.25	100.0	100.0	0.0		+1.5, -5.0

11. Peak C Sound level

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

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

Certificate No : 22-ACT-248
Request No : Req-2022-0628

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	143.2	0.2	1.5
Negative one-half cycle	143.1		
Deviated	0.1		

13. High Level Stability

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

End of Certificate

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

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 22-ACT-034
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2022-0092
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 329361
Serial Number : 0005394 Preamplifier Model : PRMLxT2C
ID : UAE.EFM.031/2564 Preamplifier S/N : 073810
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 : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA0000234	14 June 2022	TSI
Audio Generator	SvanteK	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

Approved By : 
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 21 January 2022

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

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

1. Indication at the calibration check frequency

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

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

2. Self-generated noise, Microphone installed

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

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

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

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

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

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

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

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

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

6. Frequency and time weightings at 1kHz

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

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

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

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

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139		UUC (dB)	ERR (dB)		
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0		1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.3	0.3		1.1
29.00	29	29.5	0.5		1.1

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

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

9. Level linearity including the level range control

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

10. Tone burst response

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

11. Peak C Sound level

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

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

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

12. Overload indication

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

13. High Level Stability

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

End of Certificate

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

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 22-ACT-247
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2022-0627
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 329355
Serial Number : 0005395 Preamplifier Model : PRLxT2C
ID : UAE.EFM.032/2564 Preamplifier S/N : 073797
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 : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	S/N.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svanick	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 1 April 2022

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

Certificate No : 22-ACT-247
Request No : Req-2022-0627

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)
1000 Hz 114.00 dB	113.85	113.8	-0.05	113.9	0.05	0.20	0.3

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting		
A	28.4	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		
A	28.1	0.10
C	27.7	0.10
Z	32.0	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
125 Hz	0.0	0.1	0.1	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.4	0.5	0.5	0.60	3.0
8000 Hz	0.2	0.1	0.3	0.70	5.0

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

Certificate No : 22-ACT-247
Request No : Req-2022-0627

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

Electrical response at frequency weighting, weighting network response with relative to a 1 kHz		Deviation from various Frequency			UNCERTAINTY	Acceptance
UUC Setting	FAST / 37-139	Weighting Response curve				
STD Setting		A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz		-0.2	-0.1	-0.1	0.2	2.0
125 Hz		-0.1	0.0	0.0		1.5
250 Hz		-0.1	0.0	0.0		1.5
500 Hz		-0.1	0.0	0.0		1.5
1000 Hz		0.0	0.0	0.0		1.0
2000 Hz		0.0	0.0	0.0		2.0
4000 Hz		0.0	0.0	0.0		3.0
8000 Hz		-0.1	-0.1	0.0		5.0
16000 Hz		-0.1	-0.1	-0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

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

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

เอกสารนี้ควบคุม

Certificate No : 22-ACT-247
Request No : Req-2022-0627

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC		
FAST / A / 37-139	REF	UUC	ERR	0.3	1.1
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	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.1	0.1		
39.00	39	39.3	0.3		
38.00	38	38.4	0.4		

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เอกสารนี้ควบคุม

Certificate No : 22-ACT-247
Request No : Req-2022-0627

9. Level linearity including the level range control

3. Level linearity including the level range correction					
UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
37-139	43.4	43.5	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
			UUC	ERR		
A / 37-139	Toneburst	Ref	UUC	ERR	0.3	1.0
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	134.9	-0.1		
	2	118.0	117.8	-0.2		
	0.25	109.0	108.7	-0.3		
Slow	200	128.6	128.4	-0.2		
	2	109.0	108.8	-0.2		
	0.25	100.0	99.9	-0.1		
SEL	200	129.0	129.0	0.0		
	2	109.0	109.1	+0.1		
	0.25	100.0	99.9	-0.1		

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC	ERR		
FAST / C / 95-142	REF	UUC	ERR	0.2	2.0
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		

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เอกสารนี้ควบคุม

Certificate No : 22-ACT-247
Request No : Req-2022-0627

12. Overload indication

12. Overload Indication		Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
UUC Setting	FAST / A / 37-139			UUC
STD Setting		(dB)		
Positive one-half cycle		142.2		
Negative one-half cycle		142.2		
Deviated		0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.1	0.3
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.

เอกสารนี้ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 22-ACT-105
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2022-0229
10260

Unit Under Calibration Details


Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 329350
Serial Number : 0005396 Preamplifier Model : PRMLAT2C
ID : UAE.EFM.033/2564 Preamplifier S/N : 073812
Resolution : 0.1 dB Instrument Status : Used
Calibration Environment and Details
Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2022
Calibrated Date : 11 February 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svaniek	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

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

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

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

เอกสารไม่ควบคุม

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

1. Indication at the calibration check frequency

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

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

2. Self-generated noise, Microphone installed

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

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

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

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

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

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

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

เอกสารไม่ควบคุม

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

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

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

6. Frequency and time weightings at 1kHz

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

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

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

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

เอกสารไม่ควบคุม

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

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	68.9	-0.1	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	58.9	-0.1	1.1
54.00	54	53.9	-0.1	1.1
49.00	49	48.9	-0.1	1.1
44.00	44	44.0	0.0	1.1
39.00	39	39.2	0.2	1.1
38.00	38	38.3	0.3	1.1

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

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

เอกสารไม่ควบคุม

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

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		UUC	ERR		
FAST / A	REF				Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	43.2	42.8	-0.4	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

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

11. Peak C Sound level

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

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

FM-708-SLM-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

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

12. Overload indication

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

13. High Level Stability

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

End of Certificate

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

FM-708-SLM-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate of Calibration

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

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 328675
Serial Number : 0005398 Preamplifier Model : PRLMxT2C
ID : UAE.EFM.035/2564 Preamplifier S/N : 073793
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 : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svantek	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

Approved By : 
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 21 January 2022

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

เอกสารไม่ควบคุม

FM-708-SLM-01 Rev.0 Issue date 01/07/19

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

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance
		UUC	ERR	UUC	ERR		
FAST / A / 37-139	Level	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	114.0	+0.15	113.9	0.05	0.20	0.3

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

2. Self-generated noise, Microphone installed

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

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

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

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

Table 1: Absolute signal test at frequency 125 Hz, 1000 Hz, 4000 Hz, 8000 Hz, and 15000 Hz					
UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
	Weighting Response curve				
	A	C	Z	(± dB)	(± dB)
FAST / 37-139	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.0	0.0	0.0	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.4	0.3	0.3	0.60	3.0
8000 Hz	-0.1	-0.2	-0.1	0.70	5.0

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FM-708-SLM-01 Rev.0 Issue date 01/07/19

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

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

3. Electrical signal test of frequency weightings, weighting network response with relative to 1 kHz					
UUC Setting	Deviation from various Frequency			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 37-139	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	0.2	2.0
63 Hz	-0.2	-0.1	-0.1		
125 Hz	-0.1	0.0	-0.1		
250 Hz	-0.1	0.0	-0.1		
500 Hz	-0.1	0.0	-0.1		
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)	Acceptance Limit (± dB)
FAST / 37-139	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
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)	Acceptance Limit (± dB)
37-139 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

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For the Status of Rev. 01/07/19

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

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	1.1
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	93.9	-0.1		
89.00	89	88.9	-0.1		
84.00	84	83.9	-0.1		
79.00	79	78.9	-0.1		
74.00	74	73.9	-0.1		
69.00	69	69.0	0.0		
64.00	64	63.9	-0.1		
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	39.3	0.3		
38.00	38	38.3	0.3		
37.00	37	37.5	0.5		

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For the Status of Rev. 01/07/19

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

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)	0.3	1.1
43.2	43.4	0.2			
114	114.0	0.0			

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
A / 37-139	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)	0.3	1
Fast	200	135.0	135.0	0.0		
	2	118.0	117.9	-0.1		
	0.25	109.0	108.7	-0.3		
Slow	200	128.6	128.5	-0.1		
	2	109.0	108.9	-0.1		
	200	129.0	129.0	0.0		
SEL	2	109.0	109.1	+0.1		
	0.25	100.0	99.9	-0.1		

11. Peak C Sound level

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

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For the Status of Rev. 01/07/19

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

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.2	1.5
Positive one-half cycle	142.3		
Negative one-half cycle	142.0		
Deviated	0.3	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	0.1	0.3
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.
เอกสารไม่ควบคุม
For the Status of Rev. 01/07/19



Cert.No.: 23MM331
Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S
Serial No. : 1128312528
ID No. : UAE.AIR.019/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room 2
Received order : 07 April 2023
Calibration Date : 07 April 2023
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Suwit Imjai
Approved by :
() Pornthippa Tameyakul
(/) Malee Butkruea
Issue Date : 10 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-00150C-1

Cert.No.: 23MM331
Page: 2 of 3

Procedure used :-

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	20 Jan 2024

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g **Resolution** 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	99.9999	+0.0001	0.19	2.03
200	200.0001	-0.0001	0.29	2.00

After Adjustment :

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

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00007

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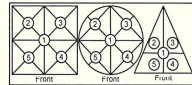


Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-00150C-1

Cert.No.: 23MM331
Page: 3 of 3

2. Effect of off center loading

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



Maximum difference between off-center and central loading (g)
0.0005

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0001	-0.0002	+0.0004	-0.0001	-0.0006

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.1	0.0999	+0.0001	0.15	2.13
1	0.9999	+0.0001	0.15	2.13
5	4.9999	+0.0001	0.15	2.13
10	9.9999	+0.0001	0.15	2.11
20	20.0000	0.0000	0.15	2.11
50	50.0000	0.0000	0.16	2.06
70	69.9999	+0.0001	0.18	2.04
100	99.9999	+0.0001	0.19	2.03
150	150.0003	-0.0003	0.29	2.00
200	200.0005	-0.0005	0.29	2.00

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

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Cert.No.: 23MM332
Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S /FACT
Serial No. : B108115858
ID No. : UAE.AIR.018/2555
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room 2
Received order : 07 April 2023
Calibration Date : 07 April 2023
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Suwit Imjai
Approved by :
() Pornthippa Tameyakul
(/) Malee Butkruea
Issue Date : 10 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0015OC-2

Cert.No.: 23MM332
Page: 2 of 3

Procedure used :-

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	20 Jan 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.					
3. This result of calibration was made on requested at the point specified by customer.					
4. This certificate is not certified for any commercial transaction.					
5. This certification is traceable to the International System of Unit.					

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g **Resolution** 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(\pm mg)	(k)
100	100.0002	-0.0002	0.21	2.06
200	200.0003	-0.0003	0.29	2.00

After Adjustment :

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

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00009
200	0.00007

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0015OC-2

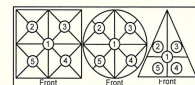
Cert.No.: 23MM332
Page: 3 of 3

Result of calibration

2. Effect of off center loading

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

The weighing machine reading error obtained is given in the table



Position 1	Position 2	Position 3	Position 4	Position 5	Maximum difference between off-center and central loading
(g)	(g)	(g)	(g)	(g)	(g)
+0.0001	-0.0003	+0.0003	+0.0006	+0.0002	0.0005

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(\pm mg)	(k)
Unload	0.0000	0.0000	0.18	2.17
0.1	0.0999	+0.0001	0.18	2.17
1	0.9998	+0.0002	0.18	2.17
5	5.0000	0.0000	0.18	2.17
10	10.0000	0.0000	0.18	2.17
20	20.0000	0.0000	0.18	2.15
50	50.0001	-0.0001	0.19	2.11
70	70.0001	-0.0001	0.20	2.07
100	100.0002	-0.0002	0.21	2.06
150	150.0004	-0.0004	0.29	2.00
200	200.0005	-0.0005	0.29	2.00

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

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