

ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือตรวจวัดและวิเคราะห์



List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments	G25A 1270	Jiranatee Associates Co.,LTD.	CO-004-66	12 Jun 23	10 Jun 24	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H749	10 Apr 24	10 Apr 25	-
5	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2301DR0024	Thai Meteorological Department	096/24	22 Feb 24	20 Feb 25	-
6	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV35 44792	Innovative Instrument Co.,Ltd.	24-ACT-038	25 Mar 24	24 Mar 25	-
7	Sound Level Meter	L _{Aeq} 24 hours, L _{Adn}	Larson Davis	LxT1 0005347	Innovative Instrument Co.,Ltd.	23-SLM-328	26 Nov 23	24 Nov 24	-
8	Sound Level Meter	L _{Aeq} 24 hours, L _{Adn}	Larson Davis	LxT1 0005341	Innovative Instrument Co.,Ltd.	23-SLM-228	28 Jun 23	26 Jun 24	-



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.: 24P1367
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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

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

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

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-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: Sukean Khunkaew
Issue Date: 23 April 2024

Approved Signatory :

[] Phalinee Pratsaipak
[] Sura Suwanmaai
[✓] Attapol Panurach

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration: Without adjustment

Function: Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.59	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24H749
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.016/2547

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024 to 18 April 2024

Reference: 2404-0247WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

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

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

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASA339	231238	16 Oct 2024

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

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

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0
-Technology Promotion Association (Thailand-Japan), NSG-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Waewwanjua
Issue Date: 18 April 2024

Approved Signatory :

[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

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Cert. No.: 24H749
Page: 2 of 2

Result of Calibration: Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	41	0.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration: Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	21.0	0.986	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	35.0	-0.027	0.72
40.013	40.0	-0.013	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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THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 22 February, 2024

Certification No. 096/24

Page : 1 of 3

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2301DR0024

Wind Sensor 2301D10024

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

81 Soi Udomauk 41, Sukhumvit Road,

Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.1 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Airt Potting Board

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

N.I.S.T. Test Reference Number 731241460 : Standard Velocity at 25 - 30 miles

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-50AH)

Serial Number 110730029 (sensor 120629586)

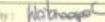
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 miles

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

: Isero, Isero 645 Serial No. 0268037 : Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type P28255 No. Y1200015

Digital Barometer Vaisala Type P28255 No. Y1200015

Calibrated by : 

Signed : 

Mr. Watchapol Subwat

Mr. Phatthana Pongtut

Mechanical Engineer

Authorized Signature

for the Chief

Sub-Standard Engineering

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THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

22 February, 2024

Certification No. 096/24

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches Hg	inches Hg	ft/min	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	-	-	-	12.9	0.11
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.9	0.12

Wind Airt Potting Board.

US DEPARTMENT OF COMMERCE WEATHER BUREAU

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

Calibrated by : 

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

22 February, 2024

Certification No. 096/24

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
1010.84	1011	-0.16
1010.80	1011	-0.40
1011.71	1012	-0.20
1012.17	1012	0.17
1012.31	1012	0.31
1012.25	1012	0.25
1012.79	1013	-0.21
1012.95	1013	-0.05
1013.52	1014	-0.48
1014.16	1014	0.16
1015.79	1016	-0.21
1016.02	1016	0.02
1015.86	1016	-0.14
1015.69	1016	0.69
1011.81	1012	-0.40
1011.80	1012	-0.20
1012.06	1012	0.06
1012.81	1013	-0.19
1013.22	1013	0.22
1013.49	1013	0.49

Average -0.02

Calibrated by : 

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

22 February, 2024

Certification No. 096/24

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Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
758.19	758	0.19
758.01	758	0.01
758.84	759	-0.16
759.19	759	0.19
759.29	759	0.29
759.25	759	0.25
759.66	760	-0.35
759.77	760	-0.23
760.20	760	0.20
760.08	761	-0.32
761.90	762	-0.10
762.08	762	0.08
761.96	762	-0.04
761.83	762	-0.17
759.89	759	-0.31
759.91	759	-0.09
759.11	759	0.11
759.67	760	-0.33
759.95	760	-0.02
760.18	760	0.18

Average -0.03

Calibrated by : 

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, 0-2399-6469

The Result of Calibration

22 February, 2024

Certification No. 096/24

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45	0.2
30.3	30	0.3
15.8	16	-0.2

Calibrated by :
Mr. Watchapol Suwut
Mechanical Engineer



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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, NO. 50 NONGSAKORN 11 TAMBON BANG KAO,
AMPHUR BANG PHU (SAMET PRAKAN PROVINCE) 10140 THAILAND
TEL : 0800-2116-7000 / FAX : 0800-2116-7140



Certificate of Calibration

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

Certificate No : 24-ACT-038
Request No : Req-2024-0579

Unit Under Calibration Details

Measurement Item : Acoustic Calibrator
Manufacturer : SVANTER
Model : SV 35
Serial Number : 44792
ID : UAE-EFM-020-2559

Class : 1
Range : 94 , 114 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 6 March 2024
Calibration Date : 25 March 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2024
THD Multimeter	2015	1047765	NIMT	14 January 2025

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

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

Calibrated By :
Mr. Noppadol Luangrat
Service Calibration Engineer

Approved By :
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 25 March 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
PM-700-ACT-02 Rev.01 Issue date:01/01/23

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, NO. 50 NONGSAKORN 11 TAMBON BANG KAO,
AMPHUR BANG PHU (SAMET PRAKAN PROVINCE) 10140 THAILAND
TEL : 0800-2116-7000 / FAX : 0800-2116-7140



Certificate No : 24-ACT-038

Request No : Req-2024-0579

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Deviated value	Measured	Deviated value		
94 dB / 1000 Hz	94.02	0.02	-	-	0.13	0.25
114 dB / 1000 Hz	114.02	0.02	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Deviated value	Measured (%)	Deviated value		
94 dB / 1000 Hz	0.04	-	-	-	0.40	2.5
114 dB / 1000 Hz	0.03	-	-	-	0.40	2.5

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory.
PM-700-ACT-02 Rev.01 Issue date:01/01/23

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, NO. 50 NONGSAKORN 11 TAMBON BANG KAO,
AMPHUR BANG PHU (SAMET PRAKAN PROVINCE) 10140 THAILAND
TEL : 0800-2116-7000 / FAX : 0800-2116-7140



Certificate of Calibration

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

Certificate No : 24-BLM-028
Request No : Req-2023-1902

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : Lx32
Serial Number : 0600347
ID : UAE-EFM-044-2563
Resolution : 0.1 dB

Microphone Class : 2
Microphone Model : 375A04
Microphone SN : 351058
Preamplifier Model : PFM6x320
Preamplifier SN : 004138
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 °C ± 2 °C)
Humidity : (50 %RH ± 20 %RH)
Barometric Pressure : (1013 hPa ± 10 hPa)
Received Date : 13 September 2023
Calibration Date : 26 September 2023
Calibration Procedure : In-house method CP-BLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests
Location of Calibration : Lab-Acoustic

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	100275	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest cal	1FAN00134	22 July 2024	TSM
Audio Generator	Scopec	Scopec	131	12 October 2023	WK Electric

Note

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

Calibrated By :
Mr. Noppadol Luangrat
Calibration Officer

Approved By :
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 26 September 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory Co., Ltd.
PM-700-BLM-01 Rev.01 Issue date:01/01/23

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Certificate No : 23-01-M-328
Request No : Req-2023-1982

1. Indication at the calibration check frequency

UUC Setting	Nominal		Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	Level	UUC	ERR	UUC	ERR	ERR		
FAST / A / 37-130		(dB)	(dB)	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
Calibrator Setting								
1000 Hz 114.00	113.70	113.8	+0.02	113.9	+0.02	0.2	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator brand SVANTER, Model SV 31A, SN. 38079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-130		
UUC Weighting	(dB)	(\pm dB)
A	23.9	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-130		
UUC Weighting	(dB)	(\pm dB)
A	23.2	0.1
C	22.5	0.1
Z	27.0	0.1

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 / 37-130					
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
125 Hz	0.0	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	3.0
4000 Hz	0.2	0.2	0.2	0.6	3.0
8000 Hz	-0.7	-0.6	-0.5	0.7	3.0

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.
PIM-700-01-M-01 Rev.0 Issue date 01/07/19

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Certificate No : 23-01-M-328
Request No : Req-2023-1982

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-130					
STD Setting				(\pm dB)	(\pm dB)
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	-0.1	0.0		1.5
500 Hz	-0.1	0.0	-0.1		1.5
1000 Hz	0.0	0.0	-0.1		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
10000 Hz	-0.1	-0.1	-0.1		+5, -0.5

6. Frequency and time weightings at 30Hz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC	ERR		
FAST / 37-130	REF	(dB)	(dB)	(\pm dB)	(\pm dB)
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	113.9	-0.1		0.2

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC	ERR		
37-130 / A	REF	(dB)	(dB)	(\pm dB)	(\pm dB)
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0	0.2	0.1
Lag	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.
PIM-700-01-M-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No : 23-01-M-328
Request No : Req-2023-1982

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-130			
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	114.0		
Final	114.0		
Deviant	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		REF	UUC	ERR	
FAST / A / 37-130					
STD dB	(dB)	(dB)	(dB)	(dB)	(\pm dB)
130.00	130	130.0	-0.1	0.8	0.8
125.00	125	125.0	0.0	0.8	1.1
120.00	120	120.0	0.0	0.8	1.1
115.00	115	115.0	0.0	0.8	1.1
110.00	110	110.0	0.0	0.8	1.1
105.00	105	105.0	0.0	0.8	1.1
100.00	100	100.0	0.0	0.8	1.1
95.00	95	95.0	0.0	0.8	1.1
90.00	90	90.0	0.0	0.8	1.1
85.00	85	85.0	-0.1	0.8	1.1
80.00	80	80.0	-0.1	0.8	1.1
75.00	75	75.0	-0.1	0.8	1.1
70.00	70	70.0	-0.1	0.8	1.1
65.00	65	65.0	-0.1	0.8	1.1
60.00	60	60.0	-0.1	0.8	1.1
55.00	55	55.0	-0.1	0.8	1.1
50.00	50	50.0	-0.1	0.8	1.1
45.00	45	45.0	-0.1	0.8	1.1
40.00	40	40.0	-0.1	0.8	1.1
35.00	35	35.0	-0.1	0.8	1.1
30.00	30	30.0	-0.1	0.8	1.1
25.00	25	25.0	-0.1	0.8	1.1
20.00	20	20.0	-0.1	0.8	1.1
15.00	15	15.0	-0.1	0.8	1.1
10.00	10	10.0	-0.1	0.8	1.1

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PIM-700-01-M-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No : 23-01-M-328
Request No : Req-2023-1982

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC	ERR		
FAST / A	REF	(dB)	(dB)	(\pm dB)	(\pm dB)
UUC Range					
37-130	38.7	38.9	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
			Ref	UUC	ERR	
A / 37-130	Touchstart		(dB)	(dB)	(dB)	(\pm dB)
UUC Time Response						
Fast	200	120.0	120.0	0.0	0.2	1
	2	110.0	117.7	-0.3		+1.0, -2.5
	0.25	100.0	108.7	-0.3		+1.5, -0.0
Slow	200	120.0	120.5	-0.1		1
	2	100.0	100.9	-0.1		+1.0, -0.0
	200	120.0	120.0	0.0		1
SPL	2	100.0	100.9	-0.1		+1.0, -2.5
	0.25	100.0	99.9	-0.1		+1.5, -0.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC	ERR		
FAST / C / 90-140	REF	(dB)	(dB)	(\pm dB)	(\pm dB)
STD Setting					
Complete cycle	137.4	136.9	-0.40	0.2	3.0
Positive half cycle	136.8	136.2	-0.30		2.0
Negative half cycle	136.4	136.2	-0.30		2.0

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PIM-700-01-M-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No : 23-0134-228
Request No : Req-2023-1492

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-130	UUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	181.9		
Negative one-half cycle	181.7		
Deviation	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-130	UUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	138.0		
Final	138.0		
Deviation	0.0	0.1	0.7

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 Institution.
เอกสารไม่ควบคุม

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 81 So Uthomok 42, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10250
Request No : Req-2023-1489

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Microphone Class : 2
Manufacturer : LARSON DAVIS
Microphone Model : 377042
Model : 1472
Microphone S/N : 11793
Serial Number : 0003341
Preamplifier Model : PM1A-T20
ID : UAE3FM1082363
Preamplifier S/N : 856133
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details

Temperature : 23.7°C \pm 2.2 °C
Humidity : 20%RH \pm 2.0 %RH
Barometric Pressure : 1013.25 kPa \pm 10.10 Pa
Received Date : 26 June 2023
Calibrated Date : 28 June 2023
Calibration Procedure : Reference method CP-90.50-01 based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Portable units
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SK	Date calibration	Traceability
Standard Microphone	GRAS	40AN	198273	6 October 2023	GRAS
Multi-frequency Calibrator	Quant	Quant-cal	EFAM0234	29 June 2023	TISI
Audio Generator	Brüel	Scaph1	131	12 October 2022	WIC 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. Nopphadol Jangrat
Mr. Nopphadol Jangrat
Calibration Officer

Approved By : Mr. Pait Mahakorn
Mr. Pait Mahakorn
Calibration Engineer Supervisor
Issue Date : 28 June 2023

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

Certificate No : 23-0134-228
Request No : Req-2023-1489

1. Indication at the calibration check frequency

UUC Setting	Measured	Before Adjust	After Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-130	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 114 dB	113.77	114.7	+0.93	113.8	+0.03
				0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SV-ANTER, Model SV 25A, SN, 73246

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-130		
UUC Weighting	(dB)	(\pm dB)
A	28.1	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-130		
UUC Weighting	(dB)	(\pm dB)
A	28.3	0.1
C	28.3	0.1
Z	32.4	0.1

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance Limit
FAST / 37-130	Weighting Response curve		
STD Setting	A (dB) C (dB) Z (dB)	(\pm dB)	(\pm dB)
125 Hz	0.0 0.1 0.1	0.0	2.0
300 Hz	0.0 0.0 0.0	0.0	1.0
4000 Hz	0.7 0.6 0.7	0.0	3.0
8000 Hz	1.2 1.1 1.2	0.7	3.0

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Certificate No : 23-0134-228
Request No : Req-2023-1489

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance Limit
FAST / 37-130	Weighting Response curve		
STD Setting	A (dB) C (dB) Z (dB)	(\pm dB)	(\pm dB)
43 Hz	-0.1 0.0 0.0		2.0
125 Hz	-0.1 0.1 0.0		1.5
250 Hz	0.0 0.0 0.0		1.5
500 Hz	0.0 0.1 0.0		1.5
1000 Hz	0.0 0.0 0.0	0.2	1.0
2000 Hz	0.1 0.1 0.0		2.0
4000 Hz	0.0 0.1 0.0		3.0
8000 Hz	0.0 0.0 0.0		0
10000 Hz	0.0 0.0 -0.1		+5, -04F

6. Frequency and time weightings at 1 kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-130	REF	UUC	ERR	
UUC Weighting	(dB)	(dB)	(dB)	(\pm 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
37-130 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	(\pm dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

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เอกสารไม่ควบคุม

Certificate No : 23-8134-228
Request No : Req-2023-1409

7. Long Term Stability

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

8. Level linearity on the reference level range

EUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	EUC	ERR	
STD dB	(dB)	(dB)	(dB)	(\pm dB)
141.00	140	141.0	0.0	0.0
140.00	140	140.0	0.0	0.0
139.00	139	139.0	0.0	0.0
138.00	138	138.0	0.0	0.0
137.00	137	137.0	0.0	0.0
136.00	136	136.0	0.0	0.0
135.00	135	135.0	0.0	0.0
134.00	134	134.0	0.0	0.0
133.00	133	133.0	0.0	0.0
132.00	132	132.0	0.0	0.0
131.00	131	131.0	0.0	0.0
130.00	130	130.0	0.0	0.0
129.00	129	129.0	0.0	0.0
128.00	128	128.0	0.0	0.0
127.00	127	127.0	0.0	0.0
126.00	126	126.0	0.0	0.0
125.00	125	125.0	0.0	0.0
124.00	124	124.0	0.0	0.0
123.00	123	123.0	0.0	0.0
122.00	122	122.0	0.0	0.0
121.00	121	121.0	0.0	0.0
120.00	120	120.0	0.0	0.0
119.00	119	119.0	0.0	0.0
118.00	118	118.0	0.0	0.0
117.00	117	117.0	0.0	0.0
116.00	116	116.0	0.0	0.0
115.00	115	115.0	0.0	0.0
114.00	114	114.0	0.0	0.0
113.00	113	113.0	0.0	0.0
112.00	112	112.0	0.0	0.0
111.00	111	111.0	0.0	0.0
110.00	110	110.0	0.0	0.0
109.00	109	109.0	0.0	0.0
108.00	108	108.0	0.0	0.0
107.00	107	107.0	0.0	0.0
106.00	106	106.0	0.0	0.0
105.00	105	105.0	0.0	0.0
104.00	104	104.0	0.0	0.0
103.00	103	103.0	0.0	0.0
102.00	102	102.0	0.0	0.0
101.00	101	101.0	0.0	0.0
100.00	100	100.0	0.0	0.0
99.00	99	99.0	0.0	0.0
98.00	98	98.0	0.0	0.0
97.00	97	97.0	0.0	0.0
96.00	96	96.0	0.0	0.0
95.00	95	95.0	0.0	0.0
94.00	94	94.0	0.0	0.0
93.00	93	93.0	0.0	0.0
92.00	92	92.0	0.0	0.0
91.00	91	91.0	0.0	0.0
90.00	90	90.0	0.0	0.0
89.00	89	89.0	0.0	0.0
88.00	88	88.0	0.0	0.0
87.00	87	87.0	0.0	0.0
86.00	86	86.0	0.0	0.0
85.00	85	85.0	0.0	0.0
84.00	84	84.0	0.0	0.0
83.00	83	83.0	0.0	0.0
82.00	82	82.0	0.0	0.0
81.00	81	81.0	0.0	0.0
80.00	80	80.0	0.0	0.0
79.00	79	79.0	0.0	0.0
78.00	78	78.0	0.0	0.0
77.00	77	77.0	0.0	0.0
76.00	76	76.0	0.0	0.0
75.00	75	75.0	0.0	0.0
74.00	74	74.0	0.0	0.0
73.00	73	73.0	0.0	0.0
72.00	72	72.0	0.0	0.0
71.00	71	71.0	0.0	0.0
70.00	70	70.0	0.0	0.0
69.00	69	69.0	0.0	0.0
68.00	68	68.0	0.0	0.0
67.00	67	67.0	0.0	0.0
66.00	66	66.0	0.0	0.0
65.00	65	65.0	0.0	0.0
64.00	64	64.0	0.0	0.0
63.00	63	63.0	0.0	0.0
62.00	62	62.0	0.0	0.0
61.00	61	61.0	0.0	0.0
60.00	60	60.0	0.0	0.0
59.00	59	59.0	0.0	0.0
58.00	58	58.0	0.0	0.0
57.00	57	57.0	0.0	0.0
56.00	56	56.0	0.0	0.0
55.00	55	55.0	0.0	0.0
54.00	54	54.0	0.0	0.0
53.00	53	53.0	0.0	0.0
52.00	52	52.0	0.0	0.0
51.00	51	51.0	0.0	0.0
50.00	50	50.0	0.0	0.0
49.00	49	49.0	0.0	0.0
48.00	48	48.0	0.0	0.0
47.00	47	47.0	0.0	0.0
46.00	46	46.0	0.0	0.0
45.00	45	45.0	0.0	0.0
44.00	44	44.0	0.0	0.0
43.00	43	43.0	0.0	0.0
42.00	42	42.0	0.0	0.0
41.00	41	41.0	0.0	0.0
40.00	40	40.0	0.0	0.0
39.00	39	39.0	0.0	0.0
38.00	38	38.0	0.0	0.0
37.00	37	37.0	0.0	0.0

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Certificate No : 23-8134-228
Request No : Req-2023-1409

9. Level linearity including the level range control

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	EUC	ERR	
EUC Range	(dB)	(dB)	(dB)	(\pm dB)
37-139	45.7	40.9	0.2	0.3
	114	114.0	0.0	0.1

10. Tone burst response

EUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
A / 37-139	Timeburst	Ref	EUC	ERR	
EUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)
Fast	200	125.0	125.0	0.0	0.0
	2	118.0	117.7	-0.3	+1.0, -0.5
	3.25	109.0	109.8	+0.2	+1.5, -0.9
Slow	200	128.0	128.5	+0.1	0.0
	2	109.0	109.8	+0.2	+1.0, -0.8
SIL	200	129.0	129.0	0.0	0.0
	2	109.0	109.9	+0.1	+1.0, -0.5
	3.25	100.0	100.0	0.0	+1.5, -0.9

11. Peak C Sound level

EUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	EUC	ERR	
STD Setting	(dB)	(dB)	(dB)	(\pm dB)
Complete cycle	137.4	136.7	-0.70	0.0
Positive half cycle	136.4	136.2	-0.20	0.0
Negative half cycle	136.4	136.3	-0.20	0.0

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Certificate No : 23-8134-228
Request No : Req-2023-1409

12. Overload indication

EUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	EUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	142.7		
Negative one-half cycle	142.8		
Deviant	-0.1	0.2	0.5

13. High Level Stability

EUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	EUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	118.0		
Final	118.0		
Deviant	0.0	0.1	0.2

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.
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