

Certificate of Calibration

Customer

Name : Mahasarakham University **Certificate No :** 23-ACT-133
 Address : 41/20 Khamriang Sub-District, Kantarawichai District, Mahasarakham **Request No :** Req-2023-1809
 44150

Unit Under Calibration Details

Measurement item	: Acoustic Calibrator	Class :	1
Manufacturer	: SVANTEK	Range : 114 dB / 1000 Hz	
Model	: SV 33B	Instrument Status : Used	
Serial Number	: 83050		
ID	: -		

Calibration Environment and Details

Temperature	: (23 ±2 °C)
Humidity	: (50 ± 20 %RH)
Barometric Pressure	: (1013 ±10.0 hPa)
Received Date	: 21 August 2023
Calibration Date	: 30 August 2023
Location of Calibration	: LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

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

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 :

pml
 Mr. Noppadon Luangart
 Service Calibration Engineer

Approved By :

mzm
 Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date : 30 August 2023

Certificate No : 23-ACT-133

Request No : Req-2023-1809

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
114 dB / 1000 Hz	114.11	0.11	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
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 (%)	Measured (%)	Measured (%)	Measured (%)		
114 dB / 1000 Hz	0.08	-	-	-	0.40	2.5

Note :

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

End of Calibration

Certificate of Calibration

Customer

Name Mahasarakham University
 Address 41/20 Khamriang Sub-District, Kantarawichai District, Mahasarakham
 44150

Certificate No : 23-SLM-288

Request No : Req-2023-1777

Unit Under Calibration Details

Measurement item :	: Sound Level Meter	Microphone Class :	1
Manufacturer :	: SVANTEK	Microphone Model :	7052E
Model :	: SVAN 977A	Microphone S/N :	70999
Serial Number :	: 69578	Preamplifier Model :	SV 12L
ID :	:	Preamplifier S/N :	73557
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 :	: 21 August 2023
Calibrated Date :	: 30 August 2023
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	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	25 July 2024	TSI
Audio Generator	Svantek	Svan401	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 : pm

Mr. Noppadon Luangart

Calibration Officer

Approved By : มร. พ.

Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date : 30 August 2023

Certificate No : 23-SLM-288

Request No : Req-2023-1777

1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 25-122							
Calibrator Setting							
1000 Hz 114 dB	114.11	114.0	-0.11	114.1	-0.01	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 33B, SN. 83050

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 25-122		
UUC Weighting	A	0.1

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 25-122		
UUC Weighting	A	0.1
C	8.9	0.1
Z	8.9	0.1

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 / 25-122					
STD Setting					
125 Hz	0.0	0.1	0.1	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	-0.2	-0.2	-0.2	0.6	1.0
8000 Hz	-0.2	-0.2	-0.3	0.7	+1.5 -2.5



Certificate No : 23-SLM-288

Request No : Req-2023-1777

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 25-122	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)		
63 Hz	-0.1	0.0	0.0	0.2	1.0
125 Hz	-0.1	0.0	0.0		1.0
250 Hz	-0.1	0.0	0.0		1.0
500 Hz	-0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	0.0	0.0	0.0		1.0
4000 Hz	0.0	0.0	0.0		1.0
8000 Hz	0.0	0.0	0.0		+1.5, -2.5
16000 Hz	-0.4	-0.4	-0.1		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 25-122		UUC (dB)	ERR (dB)		
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C		114.0	0.0		0.2
Z		114.0	0.0		0.2

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
25-122 / A		UUC (dB)	ERR (dB)		
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow		114.0	0.0		0.1
Leq		114.0	0.0		0.1

Certificate No : 23-SLM-288

Request No : Req-2023-1777

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 25-122	UUC (dB)	(\pm dB)	(\pm dB)
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated REF (dB)	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
FAST / A / 25-122				0.3	0.8
STD dB					0.8
122.00	122	122.0	0.0		0.8
121.00	121	121.0	0.0		0.8
120.00	120	120.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.1	0.1		0.8
34.00	34	34.1	0.1		0.8
29.00	29	29.1	0.1		0.8
24.00	24	24.4	0.4		0.8

Certificate No : 23-SLM-288

Request No : Req-2023-1777

9. Level linearity including the level range control

UUC Setting	STD REF	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
UUC Range 25-122	REF (dB)	29.40	29.9	0.3	0.8
	REF (dB)	114	114.0		0.8

10. Tone burst response

UUC Setting	STD Toneburst	Anticipated Ref (ms)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
			UUC (dB)	ERR (dB)		
UUC Time Response Fast	200	118.0	118.0	0.0	0.2	0.5
	2	101.0	101.0	0.0		+1.0, -1.5
	0.25	92.0	91.9	-0.1		+1.0, -3.0
Slow	200	111.6	111.6	0.0	0.2	0.5
	2	92.0	92.0	0.0		+1.0, -3.0
	0.25	83.0	82.9	-0.1		0.5
SEL	200	112.0	112.0	0.0	0.2	+1.0, -1.5
	2	92.0	92.0	0.0		+1.0, -3.0
	0.25	83.0	82.9	-0.1		0.5

11. Peak C Sound level

UUC Setting	Anticipated REF	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
STD Setting Complete cycle	REF (dB)	135.4	135.3	0.2	2.0
	REF (dB)	134.4	134.3		1.0
	REF (dB)	134.4	134.3		1.0

Certificate No : 23-SLM-288

Request No : Req-2023-1777

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 35-139	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	140.8		
Negative one-half cycle	140.8		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 35-139	UUC		(± dB)
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.1

End of Certificate

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEW,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Certificate of Calibration

Customer

Name : Mahasarakham University
Address : 41/20 Khamriang Sub-District, Kantarawichai District,
Mahasarakham 44150

Certificate No : 23-TPM-411

Request No : Req-2023-1794

Page : 1/2

Unit Under Calibration Details

Calibration Parameter	: Temperature	Range Calibration	: 30 °C to 40 °C
Instrument Name	: Area Heat Stress Monitor	Type of Sensor	: RTD
Manufacturer	: Quest Technologies	Sensor Diameter (mm)	: 4.5
Model	: QT-32	Calibration Position (mm)	: 67.5
Serial Number	: TPH110021	Intrument Status	: Used
Resolution	: 0.1 °C		
ID Number	:		

Calibration Environment and Details

Temperature	: 23 °C ± 3 °C
Humidity	: 55 %RH ± 15 %RH
Received Date	: 21 August 2023
Calibrated Date	: 24 August 2023
Calibration Procedure	: In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/ RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 27 Febuary 2023, Calibration Certificate No. : QR23-0494

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

Note

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

Approved By :

Mr. Noppadon Luangart

Technical Manager

Issue Date :

24 August 2023

INNOVATIVE INSTRUMENT CALIBRATION LAB
 INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
 7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO.
 AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
 TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 23-TPM-411

Request No : Req-2023-1794

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	30.034	29.9	+ 0.1	0.13
	35.037	34.9	+ 0.1	0.13
	40.040	39.9	+ 0.1	0.13
DRY	30.035	29.9	+ 0.1	0.13
	35.036	34.9	+ 0.1	0.13
	40.037	39.9	+ 0.1	0.13
GLOBE	30.035	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.039	40.0	0.0	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jirapukdeesakul

Certificate of Calibration

Customer

Name : Mahasarakham University
Address : 41/20 Khamriang Sub-District, Kantarawichai District,
Mahasarakham 44150

Certificate No : 23-LXM-257

Request No : Req-2023-1798

Page : 1/2

Unit Under Calibration Details

Instrument Name : Digital Lux Meter Range Calibration : 0 to 2000 lx
Manufacturer : EXTECH Instrument Status : Used
Model : 407026
Serial Number : A041048
Resolution : 1 lx
ID Number : -

Calibration Environment and Details

Temperature : 25 °C ± 2 °C
Humidity : 60 %RH ± 20 %RH
Received Date : 21 August 2023
Calibrated Date : 28 August 2023
Calibration Procedure : The measurement was done in accordance with CP-LXM-01

Reference Standard : Photometer and Illuminance Sensor, Serial No.: 30662/2, 30592/2, which was calibrated on 11 November 2022, Certificate No.: TP-1027-22

Traceability : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of Metrology (Thailand)

Note

The reported uncertainty is based on a 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 :

28 August 2023

INNOVATIVE INSTRUMENT CALIBRATION LAB
 INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
 7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEW,
 AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
 TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Calibration Note

UUC Adjustment : Zero adjustment before use

Certificate No : 23-LXM-257

Request No : Req-2023-1798

Page : 2/2

Result of Calibration :

UUC Range (Ix)	Standard (Ix)	UUC Reading (Ix)	Correction (Ix)	Uncertainty (\pm Ix)
2000	* 0	0.00	0.00	0.0058
	100	100	0	2.2 % of Reading
	500	500	0	2.2 % of Reading
	1000	999	1	2.2 % of Reading
	1500	1494	6	2.2 % of Reading
	2000	1990	10	2.2 % of Reading

* Indicates non accredited

End of Certificate

Calibrated By :

me

Mr. Noppadon Luangart

Certificate of Calibration

Customer

Name : Mahasarakham University
Address : 41/20 Khamriang Sub-District, Kantarawichai District,
Mahasarakham 44150

Certificate No : 23-LXM-261

Request No : Req-2023-1802

Page : 1/2

Unit Under Calibration Details

Instrument Name : Digital Lux Meter Range Calibration : 0 to 2000 lx
Manufacturer : EXTECH Instrument Status : Used
Model : 407026
Serial Number : A041049
Resolution : 1 lx
ID Number : -

Calibration Environment and Details

Temperature : 25 °C ± 2 °C
Humidity : 60 %RH ± 20 %RH
Received Date : 21 August 2023
Calibrated Date : 28 August 2023
Calibration Procedure : The measurement was done in accordance with CP-LXM-01

Reference Standard : Photometer and Illuminance Sensor, Serial No.: 30662/2, 30592/2, which was calibrated on 11 November 2022,
Certificate No.: TP-1027-22

Traceability : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of
Metrology (Thailand)

Note

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

Approved By :



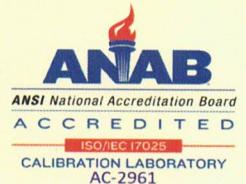
Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date :

28 August 2023

INNOVATIVE INSTRUMENT CALIBRATION LAB
 INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
 7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEW,
 AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
 TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Calibration Note

UUC Adjustment : Zero adjustment before use

Certificate No : 23-LXM-261

Request No : Req-2023-1802

Page : 2/2

Result of Calibration :

UUC Range (Ix)	Standard (Ix)	UUC Reading (Ix)	Correction (Ix)	Uncertainty (\pm Ix)
2000	* 0	0.00	0.00	0.0058
	100	101	-1	2.2 % of Reading
	500	501	-1	2.2 % of Reading
	1000	997	3	2.2 % of Reading
	1500	1493	7	2.2 % of Reading
	2000	1991	9	2.2 % of Reading

* Indicates non accredited

End of Certificate

Calibrated By :

Mr. Noppadon Luangart